




# A revised, annotated checklist of Mexican non-biting midges (Diptera, Chironomidae)

Orestes C. Bello-González<sup>1</sup>, Trond Andersen<sup>2</sup>, Norman Mercado-Silva<sup>3</sup>

<sup>1</sup> Universidad Autónoma del Estado de Morelos, Av. Universidad 1001, Col. Chamilpa, C.P. 62209, Cuernavaca, Morelos, Mexico

<sup>2</sup> Department of Natural History, University Museum of Bergen, University of Bergen, P.O. Box 7800, NO-5020, Bergen, Norway

<sup>3</sup> Centro de Investigación en Biodiversidad y Conservación (CIByC), Universidad Autónoma del Estado de Morelos, Av. Universidad 1001, Col. Chamilpa, C.P. 62209, Cuernavaca, Morelos, Mexico

Corresponding author: Trond Andersen ([trond.andersen@uib.no](mailto:trond.andersen@uib.no))

## Abstract

An updated checklist of Mexican non-biting midges (Chironomidae) is presented. A total of 110 species of Chironomidae are known for Mexico: 52 species in 25 genera belong to the subfamily Chironominae, 30 species in 13 genera to Orthoclaadiinae, 21 species in nine genera to Tanypodinae, five species in two genera to Telmatogetoninae, and two species in one genus to Diamesinae. In addition, 41 genera without identified species are listed. The highest number of species (29) is recorded from the state of Campeche, while 19 species have been found in Veracruz and 15 in Nuevo León. Few or no records exist for states in Central and Northern Mexico, or those on the Pacific coast. The type localities for 34 species are in Mexico; of these, 27 species (25% of the total number of species recorded in the country) are endemic. Twenty-nine species recorded in Mexico have a Neotropical distribution, 15 a Nearctic distribution, and 39 species are distributed in both the Neotropical and Nearctic regions or more widely. It has been suggested that as many as 1000 species might occur in Mexico; so only a little more than 10% of the expected diversity has so far been recorded.

**Key words:** Biodiversity, Nearctic, Neotropical, transition zone

Academic editor: Viktor Baranov

Received: 12 December 2023

Accepted: 12 January 2024

Published: 14 February 2024

ZooBank: <https://zoobank.org/6EF65C3B-4952-489A-83BB-BF14FBA427F0>

Citation: Bello-González OC, Andersen T, Mercado-Silva N (2024) A revised, annotated checklist of Mexican non-biting midges (Diptera, Chironomidae). ZooKeys 1191: 237–286. <https://doi.org/10.3897/zookeys.1191.117223>

Copyright: © Orestes C. Bello-González et al. This is an open access article distributed under terms of the Creative Commons Attribution License ([Attribution 4.0 International – CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)).

## Introduction

Mexico is a megadiverse country (Mittermeier et al. 2011; Mendoza-Ponce et al. 2020). Located in the Nearctic-Neotropical transition area, the north to south orientation of numerous warm, low altitude corridors, and the abundance of mountain chains with colder conditions have allowed biota to disperse during past climate change events (Halffter 1987). This high biodiversity results primarily from an accumulation of taxa from other areas and constant changes in the landscape (Priego Santander and Esteve Selma 2017) rather than local diversification (Sundaram et al. 2019; Harvey et al. 2020). However, several of the most species rich and ecologically relevant insect groups are not included in these studies.



Chironomidae have the widest distribution of all free-living groups of holometabolous insects and are likely the most taxonomically and ecologically diverse family of aquatic insects (Cranston 1995; Dijkstra et al. 2014). Reiss (1982) estimated that between 1500–2000 chironomid species might occur in tropical Mexico and Central America, and Andersen et al. (2000) suggested that as many as 1000 species can be expected to occur in Mexico. Spies et al. (2009) compiled an annotated list of the Mexican and Central American genera including a key to the genera known from the region at that time. However, the latest inventory of the Mexican chironomids only included 61 species plus an additional 25 genera without identified species (Andersen et al. 2000).

During the last two decades, several new species have been described based on material from Mexico (Kyerematen et al. 2000; Kyerematen and Andersen 2002; Wang et al. 2006; Vinogradova 2008; Andersen et al. 2010, 2016; Wiedenbrug et al. 2012; Pinho et al. 2013; Acosta et al. 2017; Pinho and Andersen 2021; Andersen 2023). Several species and genera have also been recorded for the first time from Mexico, especially in connection with surveys of particular habitats like the aquatic fauna in spring-fed tropical canyons in the southern Sonora desert (Bogan et al. 2014), or subfossil Chironomidae in surface sediments of the sinkholes of the Yucatan Peninsula (Hamerlík et al. 2018). Several of these studies are based mainly on larvae and the materials are generally not identified beyond genus level.

The Nearctic-Neotropic transition should lead to the existence of chironomid species with different biogeographic affinities. The Nearctic fauna is comparatively well known (Oliver et al. 1990; Oliver and Dillon 1994) and most chironomids in Mexico with this biogeographic affinity can be identified to genus level using the keys to the larvae, pupa and adults of the Holarctic Region (Wiederholm 1986, 1989; Andersen et al. 2013a). The Neotropical chironomids from Mexico are much less studied and more difficult to identify based on available literature.

An updated checklist of Mexican Chironomidae species is presented. The list provides an updated baseline and will facilitate the study of the chironomid fauna in the Nearctic-Neotropical biogeographical transition zone in Mexico. The checklist is based on Andersen et al. (2000), and new records and species published during the last two decades are added. Some ecological information now available for the genera recorded from Mexico are also included.

## Methods

The checklist is based on Andersen et al. (2000); references already given in that list are not repeated here. The checklist includes published records only. Records were compiled from peer reviewed scientific articles, books, and book chapters and, to a lesser extent, unpublished project reports. Specimens of Mexican chironomids are housed in several collections (Contreras-Ramos 2021; Huerta Jiménez 2021; Admin 2022; Bentley and Thomas 2022; European Bioinformatics Institute 2022); and these records can be accessed using “Name search” in GBIF (2023).

Following Ashe and O’Connor (2009) eight major zoogeographical regions are recognized: Antarctic (AN), Neotropical (NT), Nearctic (NE),



Palearctic (PA), Afrotropical (AF), Oriental (OR), Australasian (AU), and Oceanian (OC). Administratively, Mexico is divided in 32 states. Of these the 18 northernmost states are generally regarded as belonging to the Nearctic region, while the remaining 13 southern most states as belonging to the Neotropical region (Ashe and O'Connor 2009). However, the biogeographical zones are not clearly defined and depend to some degree on the group of organisms studied. There are also clearly transition zones between the two regions. Given this, taxa present in Mexico and in Central or South America are considered to be Neotropical, while taxa present in Mexico and in the USA and/or Canada are considered to be Nearctic. The exception is taxa from southern Florida, USA, which is considered to be Neotropical. However, many species are found both in South- and North America or have a wider distribution.

The checklist is arranged alphabetically. Species group names follow the genus and subfamily names. A short outline with information on the number of species, distribution, and larvae habitats is given for each genus. For literature records given as “*Cricotopus* cf. *sylvestris*” or “*Cricotopus sylvestris* group” we assume they are correctly identified to genus level. Following Ashe and O'Connor (2009), two Tanypodinae species originally described as *Macropelopia roblesi* Vargas, 1946 and *Pentaneura marmorata* Johannsen, 1938 are listed as “Generically unplaced valid Macropelopiini” and “Generically unplaced valid Tanypodinae”, respectively.

The valid species name is followed by the original combination in parenthesis, with type country (for USA, country and state) in square brackets. When the type locality is situated in Mexico, more specific information is given for the type locality. Synonyms are given if descriptions are based on Mexican material. Mexican records are then given followed by the state(s) from where the species is recorded in square brackets. Finally, the total distribution for a species is given as zoogeographical region(s), followed by the countries from where the species has been recorded. However, this list of countries might not be complete, and for widespread species it is only given as “widespread”.

### Citations for species names are arranged as follows

***Cladopelma forcipis* (Rempel, 1939: 211) (*Chironomus* (*Cryptochironomus*))** [BRAZIL]. Andersen et al. (2000: 590) [Mexico State; Morelos; Veracruz]; Vinogradova and Riss (2007: 34) [“Yucatan Peninsula”]; European Bioinformatics Institute (2022) [Quintana Roo]. NT, NE. Brazil, Colombia, Costa Rica, Guatemala, Mexico, Nicaragua, Panama, USA.

In the checklist, recorded genera lacking identified species are included. Mexican records are listed as e.g.: *Cryptochironomus* sp., followed by the state(s) from where the genus is recorded in square brackets.

Vinogradova and Riss (2007) provided numerous records from the Yucatan Peninsula, but without giving any details on the localities. As Yucatan Peninsula includes partly or totally the territory of three Mexican states; these records are listed as [“Yucatan Peninsula”].



## Results

### Check list

#### Subfamily Chironominae

##### Genus *Apedilum* Townes, 1945

A genus with three named species. *A. elachistus* Townes, 1945 is widespread throughout North and South America, *A. subcinctum* Townes, 1945 is distributed in North and Central America, and *A. griseistriatum* (Edwards, 1931) occurs in South America. Larvae are associated with submerged vegetation in ponds, canals, lakes, and slowly running rivers, both in fresh or brackish water (Epler et al. 2013).

***Apedilum elachistus* Townes, 1945: 33** [USA: Texas]. Andersen et al. (2000: 590) [States of Campeche; Puebla; Veracruz]; Contreras-Ramos et al. (2000: 25); Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]. NT, NE. Argentina (Donato et al. 2008a), Brazil, Canada (Giberson et al. 2001), Costa Rica, Guatemala, Mexico, Nicaragua, Uruguay (Donato et al. 2008a), USA.

***Apedilum subcinctum* Townes, 1945: 33** [USA: Nevada]. Andersen et al. (2000: 590) [States of Campeche; Jalisco]; Contreras-Ramos et al. (2000: 25); Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]; Contreras-Ramos (2021). NT, NE. Guatemala, Mexico, USA.

##### Genus *Asheum* Sublette & Sublette, 1983

See: *Polypedilum* Kieffer, 1912.

##### Genus *Axarus* Roback, 1980

A genus of ~ 15 species that occur in the Neotropical, Nearctic, Palaearctic, and the Australasian regions. Ten species are known from South America (Andersen and Mendes 2002a; Andersen et al. 2018; Pinho et al. 2019). Larvae occur in littoral to sublittoral soft sediments in lakes and rivers (Epler et al. 2013).

***Axarus rogersi* (Beck & Beck, 1958: 27) (*Xenochironomus*)** [USA: Florida]. Andersen et al. (2000: 590) [Campeche State]; Contreras-Ramos et al. (2000: 26); Contreras-Ramos (2021). NT, NE. Costa Rica, Mexico, Nicaragua, USA.

##### Genus *Beardius* Reiss & Sublette, 1985

A genus with > 30 named species that occur mainly in tropical areas in the Neotropical region with a few species in the southern parts of the Nearctic region (Jacobsen and Perry 2000; Pinho et al. 2013). The larvae have been found associated with macrophytes or submerged wood in both standing and flowing waters (Epler et al. 2013).

***Beardius aciculatus* Andersen & Sæther, 1996: 40** [COSTA RICA]. Andersen et al. (2000: 590) [States of Campeche; Veracruz]; Contreras-Ramos et al.



(2000: 26); Vinogradova and Riss (2007: 33) [“Yucatan Peninsula”]; Contreras-Ramos (2021); Admin (2022). NT. Costa Rica, Mexico.

***Beardius chapala* Pinho, Mendes & Andersen, 2013: 28** [MEXICO: Jalisco State, Lake Chapala, El Chante]. Endemic.

***Beardius parvus* Reiss & Sublette, 1985: 183** [VENEZUELA]. Andersen et al. (2000: 590) [Veracruz State]; Contreras-Ramos et al. (2000: 26) [Campeche State]; Contreras-Ramos (2021). NT. Costa Rica, Mexico, Nicaragua, Venezuela.

### Genus *Caladomyia* Säwedal, 1981

See: *Tanytarsus* Wulp, 1874.

### Genus *Chironomus* Meigen, 1803

One of the most species-rich and common chironomid genera, with ~ 300 described species from all zoogeographical regions except Antarctica. The larvae graze on detritus or are filter-feeders, predominantly in soft sediments of standing water, rarely in flowing water (Epler et al. 2013).

***Chironomus alchichica* Acosta & Prat in Acosta et al. 2017: 53** [MEXICO: Puebla State, Lake Alchichica]. Endemic.

***Chironomus stigmaterus* Say, 1823: 15** [USA: Pennsylvania]. Andersen et al. (2000: 590) [States of Durango; Puebla]; Alcocer et al. (2016: 411). NT, NE. Brazil, Cuba, Mexico, USA.

### Genus *Cladopelma* Kieffer, 1921

A genus of ~ 20 described species that occur in all zoogeographical regions except Antarctica and Oceania. The larvae live in streams and larger rivers, lakes, and ponds as well as brackish water and hot springs (Epler et al. 2013).

***Cladopelma forcipis* (Rempel, 1939: 211) (*Chironomus* (*Cryptochironomus*))** [BRAZIL]. Andersen et al. (2000: 590) [States of Mexico; Morelos; Veracruz]; Vinogradova and Riss (2007: 34) [“Yucatan Peninsula”]; European Bioinformatics Institute (2022) [Quintana Roo State]. NT, NE. Brazil, Colombia, Costa Rica, Guatemala, Mexico, Nicaragua, Panama, USA.

### Genus *Cladotanytarsus* Kieffer, 1921

A genus of ~ 80 described species that occur in all zoogeographical regions except Antarctica and Oceania. No named species are recorded from South America, but larval morphotypes have been recorded from Brazil (Roque et al. 2004). Larvae construct sessile cases of fine detritus and have been found in streams and larger rivers, lakes, and ponds, as well as in brackish water and hot springs (Epler et al. 2013).

***Cladotanytarsus viridiventris* (Malloch, 1915: 491) (*Tanytarsus*)** [USA: Michigan]. Andersen et al. (2000: 590) [Puebla State]. NE. Canada, Mexico, USA.



### Genus *Cryptochironomus* Kieffer, 1918

A genus of ~ 60 named species that occur in all zoogeographical regions, except Antarctica. Four species are described from South America (da Silva et al. 2010). Larvae occur on various substrates in lakes, small streams, and larger rivers (Epler et al. 2013).

***Cryptochironomus* sp.:** Vinogradova and Riss (2007: 34) [“Yucatan Peninsula”]; Granados-Ramírez et al. (2017: 45) [Morelos State].

### Genus *Dicrotendipes* Kieffer, 1913

A genus of ~ 85 described species that occur in all zoogeographic regions except Antarctica. The genus was revised by Epler (1988). The larvae inhabit the littoral sediments of standing waters and may be common in lentic habitats (Epler et al. 2013).

***Dicrotendipes aethiops* (Townes, 1945: 107)** (*Tendipes* (*Limnochironomus*)) [USA: New Mexico].

Syn.: *Tendipes* (*Limnochironomus*) *figueroai* Vargas, 1952: 48 [Mexico: Morelos State].

Andersen et al. (2000: 590) [States of Baja California; Mexico; Querétaro]; Huerta-Jiménez (2021) [Morelos State]. NE. Mexico, USA.

***Dicrotendipes californicus* (Johannsen, 1905: 217)** (*Chironomus*) [USA: California]. Andersen et al. (2000: 590) [States of Mexico; Morelos; Oaxaca; Sinaloa]; Bentley and Thomas (2022) [Michoacán State]. NT, NE. Chile, Colombia, Costa Rica, Guatemala, Mexico, Panama, Peru, USA.

**Remark.** Bentley and Thomas (2022) recorded the species from “Cojumatlán, Jalisco”. The town of Cojumatlán is located on the shoreline of Lake Chapala in the State of Michoacán. Although close to the border between the two states, the original reference to the State of Jalisco most probably is a mistake.

***Dicrotendipes neomodestus* (Malloch, 1915: 475)** (*Chironomus*) [USA: Illinois]. Andersen et al. (2000: 590) [Puebla State]; Alcocer et al. (2016: 412). NE. Canada, Mexico, USA.

***Dicrotendipes obrienorum* Epler, 1987: 148** [MEXICO: Michoacán State, Patzcuaro]. Andersen et al. (2000: 590). Endemic.

***Dicrotendipes sinoposus* Epler, 1987: 152** [MEXICO: Hidalgo State, Otongo]. Andersen et al. (2000: 590) [States of Campeche; Hidalgo; Veracruz]; Contreras-Ramos et al. (2000: 26); Vinogradova and Riss (2007: 34) [“Yucatan Peninsula”]; Contreras-Ramos (2021). NT. Brazil, Colombia, Costa Rica, Dominica, Mexico, Nicaragua.

### Genus *Einfeldia* Kieffer, 1922

The concept, content and status of *Einfeldia* have been, and to an extent remain, confusing (Cranston et al. 2016a). Narrowly defined, *Einfeldia* contains approximately five species and is distributed in the Neotropical, Nearctic, Palaearctic, Oriental, and Australasian regions. The larvae inhabit standing, predominantly dystrophic waters (Epler et al. 2013).



***Einfeldia* sp.:** Navarrete-Salgado et al. (2004: 157) [México State]; Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"].

### **Genus *Endochironomus* Kieffer, 1918**

A genus of ~ 20 named species distributed in the Nearctic, Palaearctic, Afro-tropical, and Oriental regions. The larvae occur in "Aufwuchs" on living and dead substrata in almost all types of still water; they mine leaves and stems of macrophytes preferentially in small, eutrophic standing waters (Epler et al. 2013).

***Endochironomus subtendens* (Townes, 1945: 65)** (*Tanytarsus* (*Endochironomus*)) [USA: New York]. Andersen et al. (2000: 590) [Yucatán State]. NE. Canada, Mexico, USA.

### **Genus *Endotribelos* Grodhaus, 1987**

A genus of 14 described species, all occurring in the Neotropical and Nearctic regions except one species from China. The Brazilian species were treated by Trivinho-Strixino and Pepinelli (2015). The larvae are associated with aquatic macrophytes, decaying leaves, wood, and fallen fruits in streams (Epler et al. 2013).

***Endotribelos hesperium* (Sublette, 1960: 217)** (*Tendipes* (*Tribelos*)) [USA: California]. Andersen et al. (2000: 590) [Puebla State]. NE. Mexico, USA.

### **Genus *Fissimentum* Cranston & Nolte, 1996**

A genus with four named species endemic to South America; but larval morphotypes have also been recorded from the Nearctic, Oriental, and Australasian regions (Epler et al. 2013). Larvae are found in fine sediments of lentic and lotic habitats and can tolerate desiccation (Cranston and Nolte 1996).

***Fissimentum* sp.:** Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

### **Genus *Glyptotendipes* Kieffer, 1913**

The taxonomy and nomenclature of the genus have been confusing since its establishment. *Glyptotendipes* now includes ~ 27 species, distributed in the Neartic, Palearctic, Oriental, and Afrotropical regions (Epler et al. 2013; Konar and Majumdar 2021). Three subgenera are recognized, *Glyptotendipes* s. str. (including *Phytotendipes* Goetghebuer, 1937), *Caulochironomus* Heyn, 1992, and *Heynotendipes* Spies & Sæther, 2004 (including *Trichotendipes* Heyn, 1992) (see Spies and Sæther 2004). Larvae occur in detritus-rich littoral sediments of lakes, ponds, small water bodies, and running water (Epler et al. 2013).

***Glyptotendipes* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"].



### Genus *Goeldichironomus* Fittkau, 1965

A genus of 15 named species mainly distributed in the Neotropical region (tropical and subtropical Central and South America), but several species reach their northern limits in southeastern USA (Donato and Andersen 2022). The larvae of *Goeldichironomus* are mostly found in sediments, on plants or in floating mats of vegetation in lentic habitats, in fresh to brackish water, and in oligotrophic to hypereutrophic conditions (Epler et al. 2013).

***Goeldichironomus amazonicus* (Fittkau, 1968: 260) (*Siolimya*) [BRAZIL].** Andersen et al. (2000: 590) [Veracruz]; Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"]. NT. Bahamas, Brazil, Mexico, Nicaragua, Panama, Peru, USA: Florida, Venezuela, Virgin Islands.

***Goeldichironomus carus* (Townes, 1945: 118) (*Tendipes*) [VENEZUELA].** Vinogradova and Riss (2007: 32) ["Yucatan Peninsula"]. NT, NE. Colombia, Costa Rica, Mexico, Nicaragua, Panama, Venezuela, USA.

***Goeldichironomus holoprasinus* (Goeldi, 1905: 135) (*Chironomus*) [BRAZIL].** Andersen et al. (2000: 590) [Tabasco]; Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"]. NT, NE. Argentina, Brazil, Costa Rica, Ecuador, Mexico, Nicaragua, Panama, Peru, USA, Venezuela, Virgin Islands.

### Genus *Harnischia* Kieffer, 1921

A genus of ~ 20 described species that occur in all zoogeographic regions except the Antarctic, Neotropical, and Oceanian regions. However, unnamed larvae have been recorded from Brazil (Roque et al. 2004). Larvae occur in soft sediments of generally clean lakes and larger rivers (Epler et al. 2013).

***Harnischia* sp.:** Contreras-Ramos et al. (2000: 26) [Campeche State].

### Genus *Hyporhygma* Reiss, 1982

A genus with a single named species, *H. quadripunctatum* (Malloch, 1915), distributed in eastern North America, from Newfoundland to Florida. The larvae mine leaves and stems of *Nuphar* and *Nymphaea* species (Epler et al. 2013).

***Hyporhygma* sp.:** Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"].

### Genus *Kiefferulus* Goetghebuer, 1922

Syn.: *Nilodorum* Kieffer, 1921 (see Cranston et al. 1990).

A genus with at least five species in the Holarctic region. Species previously considered to belong to *Nilodorum* are widespread in the Afrotropical, Oriental, and Australasian regions. The larvae inhabit sediments of small to medium sized waterbodies (Epler et al. 2013).

***Kiefferulus* sp.:** Contreras-Ramos et al. (2000: 26) [Campeche State].



### Genus *Lauterborniella* Thienemann & Bause, 1913

A genus with a single named species, *L. agrayloides* (Kieffer, 1911) distributed in the Neotropical, Nearctic, and Palaearctic regions. Other species referred to as *Lauterborniella* in the literature belong either to *Zavreliella* Kieffer, 1920 or to *Kribiodorum* Kieffer, 1921, or their generic affinities are unclear (Epler et al. 2013). Larvae are mobile amongst submerged vegetation in small bodies of standing water (Epler et al. 2013). In Brazilian streams they have also been found in accumulations of litter attached to stones (Sanseverino and Nessimian 2001).

***Lauterborniella* sp.:** Bogan et al. (2014: 2726) [Sonora State].

### Genus *Microchironomus* Kieffer, 1918

A genus of approximately ten species distributed in the Nearctic, Palaearctic, Afrotropical, and Oriental regions (Yan and Wang 2006). The larvae occur in lakes, rivers, and ditches, including brackish water (Epler et al. 2013).

***Microchironomus nigrovittatus* (Malloch, 1915: 456) (*Chironomus*)** [USA: Illinois]. Andersen et al. (2000: 590) [Veracruz State]. NE. Mexico, USA.

### Genus *Micropsectra* Kieffer, 1909

Based on morphological and molecular data, *Krenopsectra* Reiss, 1969 and *Parapsectra* Reiss, 1969 were recently considered to be junior synonyms of *Micropsectra* (Ekrem et al. 2010). The three genera have a Holarctic distribution with ~ 100 valid species. The larvae have been recorded from a wide range of habitats, including hygropetric situations, thermal springs, moorland pools, and temporary pools. They are often found in muddy deposits in slow flowing stretches of streams and small rivers and in mesotrophic and oligotrophic lakes (Epler et al. 2013).

***Micropsectra* sp.:** Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"]; Alcocer et al. (2016: 411) [Puebla State].

**Remarks.** Both records from Mexico appear to be based on larvae only. According to Epler et al. (2013) the larvae of *Micropsectra* can be difficult to separate from *Tanytarsus* larvae.

### Genus *Microtendipes* Kieffer, 1915

A genus of ~ 55 named species that occur in all zoogeographic regions, except Antarctica; Neotropical records are based only on larvae not identified to species level (Roque et al. 2004). Larvae are found in littoral and sublittoral sediments of lakes, and in sediments and submerged mosses in running water (Epler et al. 2013).

***Microtendipes* sp.:** Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"]; Granados-Ramírez et al. (2017: 45) [Mexico State].



### Genus *Nandeva* Wiedenbrug, Reiss & Fittkau, 1998

A genus with seven described species that occur in the Neotropical and Australasian regions (Andersen et al. 2011b). The only described larvae was found in semi-immersed leaf litter packs in a tropical stream in Australia (Cranton 2019).

***Nandeva strixinorum* Sæther & Roque, 2004: 67** [BRAZIL]. Andersen et al. (2011b: 55) [Campeche State]. NT. Brazil, Mexico.

### Genus *Nilothauma* Kieffer, 1921

A genus with > 60 described species distributed throughout most zoogeographic regions except Antarctica. The Neotropical species were reviewed by Pinho and Andersen (2021). The larvae inhabit littoral and sublittoral soft sediments of lakes, streams, and rivers (Epler et al. 2013).

***Nilothauma maya* Pinho & Andersen, 2021: 103** [MEXICO: Campeche State, Calakmul]. Endemic to Mexico.

### Genus *Nimbocera* Reiss, 1972

See: *Tanytarsus* Wulp, 1874.

### Genus *Omisus* Townes, 1945

See: *Zavreliella longiseta* Reiss, 1990.

### Genus *Oukuriella* Epler, 1986

A genus of > 20 species restricted to the Neotropical region. The larvae can be found associated with freshwater sponges or submerged wood in streams and rivers (Fusari et al. 2014). Species associated with sponges were revised by Fusari et al. (2014).

***Oukuriella annamae* Epler, 1996: 4** [COSTA RICA]. Andersen et al. (2000: 590) [Campeche State]; Contreras-Ramos et al. (2000: 26). NT. Brazil (Bellodi et al. 2016), Costa Rica, Mexico.

***Oukuriella oliveirai* Messias & Fittkau, 1997: 256** [BRAZIL]. Bellodi et al. (2016: 191) [Campeche State]. NT. Brazil, Mexico.

***Oukuriella simulatrix* Epler, 1986: 160** [COLOMBIA]. Andersen et al. (2000: 590) [Campeche State]; Contreras-Ramos et al. (2000: 26); Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]; Bellodi et al. (2016: 193). NT. Colombia, Mexico.

### Genus *Parachironomus* Lenz, 1921

The genus has a worldwide distribution with at least 30 species in the Holarctic region and 20 species in the Neotropical region (Trivinho-Strixino et al.



2010; Epler et al. 2013). The adults of the Neotropical species were revised by Spies et al. (1994). Larvae are found in lentic and lotic water bodies under a wide range of conditions, including leaf miners in submerged macrophytes; they also live in association with Bryozoa or are ectoparasites on other invertebrates (Epler et al. 2013).

***Parachironomus directus* (Dendy & Sublette, 1959: 514)** (*Tendipes* (*Cryptochironomus*)) [USA: Alabama]. Andersen et al. (2000: 590) [Morelos State]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]. NT, NE. Mexico, Nicaragua, Panama, USA.

***Parachironomus hazelriggi* Spies, 2000: 133** [USA: California]. Andersen et al. (2000: 590) as *P. monochromus* Wulp, 1874 [States of Querétaro; Mexico]; Spies (2000: 134) [Guanajuato State; Mexico City]. NE, PA. Canada, Mexico, Russia (Orel 2017: 535), USA.

**Remarks.** According to Spies (2000: 129) *P. monochromus* Wulp, 1874 is today considered to be a Palaearctic species and listing from Mexico following Spies & Reiss (1996: 71) must be changed to *P. hazelriggi*.

***Parachironomus tenuicaudatus* (Malloch, 1915: 475)** (*Chironomus*) [USA: Illinois]. Andersen et al. (2000: 590) [Puebla State]. NE, PA. Widespread.

**Remarks.** According to Spies (2000: 133) the record from Puebla is based on Alcocer et al. (1993) and must be considered as uncertain as it appears to be based on immature specimens only.

### Genus *Paracladopelma* Harnisch, 1923

The genus has a predominantly Holarctic distribution, with at least 20 known species; many species are also recorded from the Oriental region (Epler et al. 2013; Yan et al. 2008). The Holarctic species were reviewed by Jackson (1977). Larvae inhabit sandy substrata in lakes, streams, and small rivers and the soft profundal sediments of deep lakes (Epler et al. 2013).

***Paracladopelma* sp.:** Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

### Genus *Paralauterborniella* Lenz, 1941

A genus with two described species; one of them, *P. nigrohalteralis* (Malloch, 1915), is widely distributed (Tang 2016). The larvae usually occur in littoral soft sediments of lakes (Epler et al. 2013).

***Paralauterborniella* sp.:** Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

### Genus *Paratanytarsus* Thienemann & Bause, 1913

A genus of > 60 named species that occur in all zoogeographical regions except Antarctica. The larvae inhabit brackish ponds, cool streams, lakes, rivers, reservoirs, and marshes (Epler et al. 2013).

***Paratanytarsus tolucensis* Reiss, 1972: 62** [MEXICO: Mexico State, Nevado de Toluca]. Andersen et al. (2000: 590). Endemic.



### Genus *Paratendipes* Kieffer, 1911

A genus of nearly 40 named species that occur in the Afrotropical and Oriental regions and in the Holarctic realm (Qi et al. 2009). For South America there are only records of unnamed species (Roque et al. 2004; Trivinho-Strixino 2011). Larvae are found in lakes, ponds, small water bodies, bogs, and hot springs and in streams and rivers in soft sediments and sandy bottoms (Epler et al. 2013).

***Paratendipes* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]; Bogan et al. (2014: 2726) [Sonora State]; Hamerlík et al. (2018: 217) [Yucatan State].

### Genus *Phaenopsectra* Kieffer, 1921

A genus of more than ten named species that occur in all zoogeographical regions except the Antarctic, Oriental, and Australasian regions. The larvae mainly occur in sandy and muddy sediments of small standing and flowing waters, but also on submerged water plants and hard substrata (Epler et al. 2013).

***Phaenopsectra* sp.:** Navarrete-Salgado et al. (2004: 157) [México State]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

### Genus *Polypedilum* Kieffer, 1912

#### ***Asheum* Sublette & Sublette, 1983, as subgenus**

Syn.: *Pedionomus* Sublette, 1964 (see Sæther and Sundal 1999).

The largest genus of Chironomidae, with > 500 described species that occur in all zoogeographical regions except Antarctica. Based on imaginal characters, eight subgenera were recognized by Sæther et al. (2010), namely *Tripedilum* Kieffer, 1921; *Polypedilum* s. str.; *Pentapedilum* Kieffer, 1913; *Tripodura* Townes, 1945; *Uresipedilum* Oyewo & Sæther, 1998; *Cerobregma* Sæther & Sundal, 1999; *Kribionympha* Kieffer, 1921; and *Probolum* Andersen & Sæther, 2010. However, the delimitation of the subgenera within *Polypedilum* was questioned by Yamamoto and Yamamoto (2015) and Cranston et al. (2016b). The position of *Asheum* is unclear but is usually treated as a subgenus within *Polypedilum* (see Pinho and Silva 2020). Larvae of *Polypedilum* occur in virtually all still and flowing waters, except in the Arctic and at high elevation. They are mostly found in sediments, mining water plants or specializing in plant-held waters (phytotelmata) (Epler et al. 2013).

***Polypedilum (Asheum) beckae* (Sublette, 1964a: 137) (*Pedionomus*)** [USA: Louisiana]. Andersen et al. (2000: 590) [States of Campeche; Veracruz]; Contreras-Ramos et al. (2000: 25). NT, NE. Dominican Republic, Mexico, USA.

***Polypedilum (Asheum) curticaudatum* Rempel, 1939: 214 [BRAZIL].** Vinogradova and Riss (2007: 33) (as: *Pedionomus curticaudatus*) ["Yucatan Peninsula"]; Pinho and Silva (2020: 184). NT. Brazil, Mexico.



***Polypedilum (Polypedilum) purus* Bidawid-Kafka, 1996: 216** [BRAZIL]. Vinogradova and Riss (2007: 33) [“Yucatan Peninsula”]. NT. Brazil, Mexico.

***Polypedilum (Tripodura) bacalar* Vinogradova, 2008: 279** [MEXICO: Quintana Roo State, Chetumal, Lake Bacalar]; Zhang et al. (2016: 41). Endemic.

***Polypedilum (Tripodura) rissi* Vinogradova, 2008: 281** [MEXICO: Yucatan State, Lake Punta Laguna]. Vinogradova (2008: 281) [Quinto Roo]; Zhang et al. (2016: 47). NT. Guatemala, Mexico

***Polypedilum (Tripodura) spiesi* Vinogradova, 2008: 278** [BELIZE]. Vinogradova (2008: 278) [Quintana Roo State]; Zhang et al. (2016: 48). NT. Belize, Mexico.

***Polypedilum (Uresipedilum) pedatum* Townes, 1945: 55** [USA: New York & Washington]. Andersen et al. (2000: 590) [Nuevo León State]. NE. Canada, Mexico, USA.

**Remarks.** Townes (1945: 55) described two subspecies, *P. pedatum pedatum* from New York and *P. pedatum excelsius* from Washington. Andersen et al. (2000: 590) recorded the species as *P. (Polypedilum) pedatum* Townes, while Sæther and Oyewo (2008: 3) placed it in subgenus *Uresipedilum*.

***Polypedilum rohneri* Vinogradova, 2008: 286** [BELIZE]. Vinogradova (2008: 286) [Yucatan State]. NT. Belize, Guatemala, Mexico.

**Remarks.** The species is not assigned to a subgenus. According to Vinogradova (2008: 288) it might deserve a separate subgenus.

### Genus *Pseudochironomus* Malloch, 1915

A genus with at least 30 species distributed in the Neotropical, Nearctic, and Palaearctic regions. The Brazilian species have recently been treated by Shimabukuro et al. (2017) and Trivinho-Strixino and Shimabukuro (2018). The larvae inhabit sandy or gravelly littoral sediments, primarily in meso- or oligotrophic lakes or in large, slow flowing rivers (Epler et al. 2013).

***Pseudochironomus seipi* Andersen, 2023** [MEXICO: Chiapas State, Chintul, Río Chintul]. NT. Costa Rica, Mexico.

### Genus *Rheotanytarsus* Thienemann & Bause, 1913

A genus with ~ 100 species distributed in all zoogeographic regions except Antarctica. The Central American and Mexican species were reviewed by Kyerematen and Andersen (2002); the *Rheotanytarsus pellucidus* group was revised by Kyerematen et al. (2000). Larvae are rheobiontic, occurring in streams, large rivers, and the littoral of lakes where wave action simulates the action of flowing water (Epler et al. 2013).

***Rheotanytarsus calakmulensis* Kyerematen & Andersen, 2002: 33** [MEXICO: Campeche State, Calakmul Biosphere Reserve]. Endemic.

***Rheotanytarsus contrerasi* Andersen & Sæther in Kyerematen et al., 2000: 166** [MEXICO: Puebla State, Mpio. Progreso, Río San Juan]. Kyerematen et al. (2000: 166) [Nuevo León State]. Endemic.

***Rheotanytarsus foliatus* Kyerematen & Andersen, 2002: 35** [COSTA RICA]. Kyerematen and Andersen (2002: 35) [Nuevo León State]. NT. Costa Rica, Mexico.



***Rheotanytarsus hansenii* Kyerematen & Andersen, 2002: 42** [MEXICO: Oaxaca State, Candelaria Loxiela]. Kyerematen and Andersen (2002: 42) [Morelos State]. Endemic.

***Rheotanytarsus kusii* Kyerematen & Andersen, 2002: 37** [MEXICO: Nuevo León State, Allende, Río Ramos]. Endemic.

***Rheotanytarsus nuamae* Kyerematen & Andersen, 2002: 38** [MEXICO: Nuevo León State, Allende, Río Ramos]. Endemic.

***Rheotanytarsus ramirezae* Kyerematen & Andersen, 2002: 46** [MEXICO: Nuevo León State, Santiago, Cola de Caballo]. Endemic.

#### **Genus *Saetheria* Jackson, 1977**

A genus of seven named species that occur in the Neotropical, Nearctic, and Palearctic regions (Orel 2014). Only unnamed larvae have so far been recorded from South America (Roque et al. 2004). Larvae inhabit sandy substrata of lakes and streams (Epler et al. 2013).

***Saetheria* sp.:** Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

#### **Genus *Skutzia* Reiss, 1985**

A genus of six species that occur in the Neotropical, Nearctic, and Oriental regions. The genus was revised by Pinho et al. (2009a). The larvae are unknown. However, they can be expected to construct transportable cases of sand grains, small wood or plant remains, as seen in the larvae of other species in the subtribe Zavreliina.

***Skutzia quetzali* Pinho, Mendes & Andersen, 2009a: 204** [MEXICO: Campeche State, Calakmul, Ejido Nuevo Becan, El Chorro]. NT. Mexico, Panama.

#### **Genus *Stempellina* Thienemann & Bause, 1913**

A genus of at least 20 species that occur in all zoogeographic regions except Antarctica. The larvae construct long, curved, tapered, transportable cases of fine sand and silt. They are eurytopic, occurring in springs, streams, larger rivers, lakes, brackish water, moorland pools, and in thermal springs (Epler et al. 2013).

***Stempellina* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"]; Bogan et al. (2014: 2726) [Sonora State].

#### **Genus *Stempellinella* Brundin, 1947**

A genus of ~ 20 described species that occur in all zoogeographical regions except Antarctica. The larvae construct straight, transportable cases of fine sand and silt, often speckled with detritus; they occur in unpolluted springs and small streams as well as in lakes (Epler et al. 2013).

***Stempellinella* sp.:** Vinogradova and Riss (2007: 34) ["Yucatan Peninsula"]; Bogan et al. (2014: 2726) [Sonora State].



### Genus *Stenochironomus* Kieffer, 1919

A genus of > 100 described species that occur in all zoogeographic regions except Antarctica. The genus was revised by Borkent (1984). South American species were treated by Dantas et al. (2016). Larvae are obligate miners in living or dead vegetation including woody parts of plants, in both lentic and lotic situations (Epler et al. 2013).

***Stenochironomus leptopus* Kieffer, 1906: 19** [ST. VINCENT]. Andersen et al. (2000: 590) [Mexico, without specific locality]. NT. Costa Rica, Dominica, Ecuador, Guatemala, Mexico, St. Vincent.

### Genus *Sublettea* Roback, 1975

A small genus with four species distributed in the Neotropical, Nearctic, and Oriental regions (Ashe et al. 1987). The larvae occur in flowing waters including cool, clean, fast flowing, temperate streams and warm, tropical rivers and streams (Epler et al. 2013). The only known larva construct soft, non-transportable cases of fine granules and silk that are attached to the substrate (Roback 1975).

***Sublettea* sp.:** Vinogradova and Riss (2007: 34) [“Yucatan Peninsula”].

### Genus *Tanytarsus* Wulp, 1874

Syn.: *Nimbocera* Reiss, 1972 (see Sanseverino et al. 2010).

Syn.: *Caladomyia* Säwedal, 1981 (see Lin et al. 2018).

A species-rich genus with > 350 described species that occur in all zoogeographic regions except Antarctica. A molecular phylogeny of the genus was presented by Lin et al. (2018), placing *Caladomyia* as a junior synonym of *Tanytarsus*. The larvae are found in all types of freshwaters, with some marine, and at least one terrestrial species. The freshwater species usually construct long, soft tubes that are fixed to the bottom substrate (Epler et al. 2013).

***Tanytarsus hastatus* Sublette & Sasa, 1994: 56** [GUATEMALA]. Andersen et al. (2000) [Sinaloa State]; Vinogradova and Riss (2007) [“Yucatan Peninsula”]. European Bioinformatics Institute (2022). NT, NE. Brazil, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Peru, USA, Venezuela.

***Tanytarsus pistra* (Sublette & Sasa, 1994: 54) (*Caladomyia*)** [GUATEMALA]. Vinogradova and Riss (2007: 32) [“Yucatan Peninsula”]. NT, NE. Guatemala, Mexico, USA (Lathrop and Mulla 1995).

### Genus *Tribelos* Townes, 1945

A genus with less than 10 named species distributed mainly in the Nearctic and Palaearctic regions. The genus is also recorded from the Neotropical region (Trivinho-Strixino et al. 2000). The larvae occur in littoral sediments of small to large water bodies (Epler et al. 2013).

***Tribelos* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State].



### Genus *Xenochironomus* Kieffer, 1921

A genus with ~ 20 species distributed in the Neotropical, Nearctic, Palaearctic, Oriental, and Australasian regions. The genus was revised by Fusari et al. (2013). The larvae of almost all species are obligate miners in freshwater sponges in standing and flowing waters (Epler et al. 2013).

***Xenochironomus* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

### Genus *Xestochironomus* Sublette & Wirth, 1972

A genus of more than ten described species that occur only in the Neotropical and Nearctic regions (Pinho and Souza 2013; Bello-González et al. 2016). Known larvae are miners in immersed wood in running waters (Epler et al. 2013).

***Xestochironomus latilobus* Borkent, 1984: 29** [VENEZUELA]. Andersen et al. (2000: 590) [Campeche State]; Contreras-Ramos et al. (2000: 26). NT. Costa Rica, Mexico, Venezuela.

### Genus *Zavreliella* Kieffer, 1920

A genus with ~ 15 species; according to Fusari et al. (2017), 13 of these are known from tropical South America. The genus was revised by Reiss (1990). Larvae build transportable cases and move among submerged vegetation in standing water, but can also be found in sediments in flowing waters (Epler et al. 2013).

***Zavreliella longiseta* Reiss, 1990: 112** [BRAZIL]. Contreras-Ramos and Andersen (1999: 4, as *Omisus* sp.) [Campeche State]; Contreras-Ramos et al. (2000: 26, as *Omisus* sp.); Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]. NT. Brazil, Costa Rica, Mexico, Panama.

**Remarks.** The genus *Omisus* Townes, 1945 was recorded from Campeche State by Contreras-Ramos and Andersen (1999) and Contreras-Ramos et al. (2000). However, this record is incorrect. At closer examination the specimens belong to *Zavreliella longiseta* Reiss, 1990, a species that lacks dark spots in the wing and has a second, strong, curved spur on the hind tibia. The generic diagnosis given by Reiss (1990) should thus be amended accordingly.

### Subfamily Diamesinae

#### Genus *Diamesa* Meigen, 1835

A genus of > 100 named species distributed in the Nearctic, Palaearctic, Afrotropical, and Oriental regions. Larvae of *Diamesa* are generally adapted to cool waters, inhabiting flowing water, springs, and to a lesser extent shallow still water and the hygropetric zone; they can be dominant in the cryon zone of glacier fed streams (Sæther and Andersen 2013a).



***Diamesa mexicana* Serra-Tosio, 1977: 100** [MEXICO: Mexico State, Lake Nevado de Toluca]. Andersen et al. (2000: 589); Ashe and O'Connor (2009: 281). Endemic.  
***Diamesa reissi* Serra-Tosio, 1977: 99** [MEXICO: Mexico State, Lake Nevado de Toluca]. Andersen et al. (2000: 589); Ashe and O'Connor (2009: 283). Endemic.

#### **Genus *Pseudokiefferiella* Zavřel, 1941**

The only included species, *Pseudokiefferiella parva* (Edwards, 1932), is distributed in the Nearctic and Palaearctic regions. The larvae inhabit small streams and the hygropetric zone (Sæther and Andersen 2013a).

***Pseudokiefferiella* sp.:** Bogan et al. (2014: 2726) [Sonora State].

#### **Subfamily Orthoclaadiinae**

Syn.: Prodiamesinae (see Lin et al. 2022).

#### **Genus *Allocladius* Kieffer, 1913**

A genus of 25 named species that occur in all zoogeographical regions, except Antarctica and Oceania. Andersen et al. (2010) reviewed the South American species; a revision of the genus was given by Ferrington and Sæther (2011). The larvae of *Allocladius* appear to be truly aquatic, as they have been found in ponds, rivers, and streams, including the shores of brackish water bodies and salt marshes, but some are probably able to survive in moist sandy substrata (Andersen et al. 2013b).

***Allocladius nanseni* (Kieffer, 1926: 82) (*Camptocladius*)** [CANADA]. Ferrington and Sæther (2011: 66) [Mexico State]; Ashe and O'Connor (2012a: 118). NE, PA. Widespread.

#### **Genus *Antillocladius* Sæther, 1981**

A genus of 30 named species that occur mostly in the Neotropical region, but are also found in the Nearctic, Palaearctic, and Oriental regions (Ashe and O'Connor 2012a; Andersen and Hagenlund 2017). The genus was reviewed by Mendes et al. (2004, 2011) and Mendes and Andersen (2008). Known larvae from South America appear to be terrestrial or semi-terrestrial as they have been collected in moss and lichens on stones and tree trunks; a North American species has been found in seeps near streams and impoundments (Mendes et al. 2004; Andersen et al. 2013b).

***Antillocladius arcuatus* Sæther, 1982: 474** [USA: South Carolina]. Mendes et al. (2004: 29) [Nuevo León State]; Mendes and Andersen (2008: 21); Ashe and O'Connor (2012a: 121). NT, NE. Brazil, Mexico, USA, Venezuela.

***Antillocladius calakmulensis* Mendes, Andersen & Sæther, 2004: 32** [MEXICO: Campeche State, Calakmul Biosphere Reserve]. Mendes and Andersen (2008: 28); Ashe and O'Connor (2012a: 122); Admin (2022). Endemic.



***Antillocladius herradurus* Mendes, Andersen & Sæther, 2004: 39** [MEXICO: Campeche State, Calakmul Biosphere Reserve]. Mendes and Andersen (2008: 33); Ashe and O'Connor (2012a: 122); Admin (2022). Endemic.

***Antillocladius pluspilalus* Sæther, 1982: 474** [USA: South Carolina]. Mendes et al. (2004: 48) [Campeche State]; Mendes and Andersen (2008: 36); Ashe and O'Connor (2012a: 122). NT, NE. Ecuador, Mexico, Nicaragua, USA.

***Antillocladius zempoalensis* Mendes, Andersen & Sæther, 2004: 57** [MEXICO: Morelos State, Lagunas de Zempoala National Park]. Mendes and Andersen (2008: 41); Ashe and O'Connor (2012a: 124). Endemic.

#### **Genus *Bryophaenocladus* Thienemann, 1934**

A species-rich genus with ~ 120 named species that occur in all zoogeographic regions, except Antarctica and Oceania. Neotropical and Mexican species were reviewed by Wang et al. (2006). The larvae of most species are terrestrial or semi-terrestrial, but a few are aquatic (Andersen et al. 2013b).

***Bryophaenocladus digitatus* Sæther, 1973: 55** [USA: South Dakota]. Wang et al. (2006: 23) [Campeche State]; Ashe and O'Connor (2012a: 141). NE. Mexico, USA.

***Bryophaenocladus humerosus* Wang, Andersen & Sæther, 2006: 26** [MEXICO: Morelos State, Lagunas de Zempoala National Park]. Ashe and O'Connor (2012a: 144); Admin (2022). Endemic.

***Bryophaenocladus pichinensis* Wang, Andersen & Sæther, 2006: 28** [ECUADOR]. Wang et al. (2006: 28) [States of Nuevo León; Puebla]; Ashe and O'Connor (2012a: 150); Admin (2022). NT. Ecuador, Mexico.

***Bryophaenocladus simplex* Wang, Andersen & Sæther, 2006: 30** [MEXICO: Nuevo León State, Allende, Río Ramos]. Wang et al. (2006: 30) [Nuevo León State, Santiago]; Ashe and O'Connor (2012a: 152); Admin (2022). Endemic.

#### **Genus *Cardiocladius* Kieffer, 1912**

A genus of 20 named species that occur in all zoogeographic regions except Antarctica and Oceania. The Neotropical species were reviewed by Andersen et al. (2016). The larvae live in fast-flowing waters and are often associated with the immature stages of blackflies (Simuliidae), on which they are reported to be predaceous (Andersen et al. 2013b).

***Cardiocladius moreloensis* Andersen, Hagenlund & Pinho, 2016: 277** [MEXICO: Morelos State, Estación Ceamish]. Endemic.

#### **Genus *Clunio* Haliday, 1855**

A genus of 25 described species that occur in all zoogeographic regions except Antarctica. The larvae are marine and believed to be omnivorous, feeding on algae and dead or dying animals (Andersen et al. 2013b).

***Clunio* sp.:** Sotelo-Casas et al. (2014: 17) [Nayarit State: Marieta Islands].



### Genus *Corynoneura* Winnertz, 1846

A genus of ~ 100 named species that occur in all zoogeographic regions except Antarctica. A review of the Neotropical species was given by Wiedenbrug et al. (2012). Larvae occur in virtually all types of aquatic habitats, from standing waters to fast-flowing streams (Andersen et al. 2013b).

***Corynoneura zempoala* Wiedenbrug, Lamas & Trivinho-Strixino, 2012: 55.**  
[MEXICO: Morelos State, Parque Nacional Lagunas de Zempoala]. Endemic.

### Genus *Cricotopus* Wulp, 1874

Syn.: *Paratrichocladius* Santos Abreu, 1918 (see Cranston and Krosh 2015)

A genus of ~ 270 named species that occur in all zoogeographic regions except Antarctica. Seven subgenera are recognized, namely *Cricotopus* s. str.; *Isocladius* Kieffer, 1909; *Maurius* Lehmann, 1981; *Nostocladius* Ashe & Murray, 1980; *Oliveiriella* Wiedenbrug & Fittkau, 1997; *Paratrichocladius* Santos Abreu, 1918; and *Pseudocricotopus* Nishida, 1987 (see Ashe and O'Connor 2012a; Andersen et al. 2013b; Cranston and Krosch 2015). Larvae inhabit all types of freshwaters including saline coastal waters. They are frequently associated with aquatic plants, including algae, and some mine living parts of aquatic macrophytes (Andersen et al. 2013b).

***Cricotopus (Cricotopus) bicinctus* (Meigen, 1818: 41) (*Chironomus*) [AUSTRIA].**  
Andersen et al. (2000: 589) [States of Mexico; Guerrero; Sinaloa]; Ashe and O'Connor (2012a: 209). NT, NE, PA, OR, OC. Widespread.

***Cricotopus (Isocladius) sylvestris* (Fabricius, 1794: 252) (*Tipula*) [GERMANY].**  
Andersen et al. (2000: 589) [States of Mexico; Guanajuato]; Ashe and O'Connor (2012a: 245). NT, NE, PA. Widespread.

***Cricotopus (Cricotopus) triannulatus* (Macquart, 1826: 202) (*Chironomus*) [FRANCE].**  
Andersen et al. (2000: 589) [Puebla State]; Ashe and O'Connor (2012a: 231); Alcocer et al. (2016: 411). NE, PA. Widespread.

### Genus *Diplosmittia* Sæther, 1981

A genus of 10 named species distributed in the Neotropical and Nearctic regions. A review of the genus was provided by Pinho et al. (2009b). Wiedenbrug and Silva (2016) added a species from the Dominican Republic. The immatures are unknown.

***Diplosmittia harrisoni* Sæther, 1981: 30 [ST. LUCIA].** Pinho et al. (2009b: 177) [Campeche State]; Ashe and O'Connor (2012a: 262). NT. Costa Rica, Mexico, St. Lucia, St. Vincent, Venezuela.

### Genus *Gravatamberus* Mendes & Andersen, 2008

A genus with five named species endemic to the Neotropical region. Larvae have been found in bromeliads (Mendes and Andersen 2008).



***Gravatamberus curtus* Mendes & Andersen, 2008: 45** [MEXICO: Campeche State, Calakmul Biosphere Reserve]. Ashe & O'Connor (2012a: 293); Admin (2022). NT. Costa Rica, Mexico.

**Remarks.** Epler (2017) recorded *Gravatamberus guatemaltecus* Mendes & Andersen, 2008 from Zurquí de Moravia in Costa Rica and commented on the variation in *G. curtus*.

### Genus *Limnophyes* Eaton, 1875

A genus of > 90 named species that occur in all zoogeographic regions except Oceania. Sæther (1990a, b) revised the Holarctic, Afrotropical, and Neotropical species of the genus. The larvae are eurytopic, including aquatic, semiterrestrial and terrestrial habitats (Andersen et al. 2013b).

***Limnophyes* sp.:** Andersen et al. (2000: 591) [Puebla State].

### Genus *Lopescladius* Oliveira, 1967

A genus with eight named species from the Neotropical and Nearctic regions. Two subgenera are recognized, namely *Lopescladius* s. str. and *Cordiella* Coffman & Roback, 1984 (see Ashe and O'Connor 2012a). South American species of *Lopescladius* (*Cordiella*) were described by Hagenlund et al. (2010). Larvae inhabit streams with sandy sediments (Trivinho-Strixino 2011).

***Lopescladius (Lopescladius) verruculosus* Sæther, 1983: 289** [MEXICO: Michoacán State, Tocomán]. Andersen et al. (2000: 589); Ashe and O'Connor (2012a: 365). NE. Mexico, USA.

### Genus *Mesosmittia* Brundin, 1956

A genus of 18 named species that occur in the Neotropical, Nearctic, Palaearctic, Afrotropical, and Oriental regions. The Neotropical and Mexican species were reviewed by Andersen and Mendes (2002b). The immatures are likely terrestrial (Andersen et al. 2013b).

***Mesosmittia acutistylus* Sæther, 1986: 43** [USA: New Mexico]. Andersen & Mendes (2002b: 143) [Campeche State]; Ashe and O'Connor (2012a: 369). NE. Mexico, USA.

***Mesosmittia annae* Andersen & Mendes, 2002b: 143** [GUATEMALA]. Andersen and Mendes (2002b: 143) [Campeche State]; Ashe and O'Connor (2012a: 369); Admin (2022). NT. Guatemala, Mexico.

***Mesosmittia guanajensis* Andersen & Mendes, 2002b: 147** [MEXICO: Guanajuato State, Acámbaro]. Ashe and O'Connor (2012a: 370); Admin (2022). Endemic.

***Mesosmittia lobiga* Sæther, 1986: 45** [USA: New Mexico]. Andersen and Mendes (2002b: 150) [States of Guanajuato; Nuevo León]; Ashe and O'Connor (2012a: 370). NT, NE. Mexico, Puerto Rico, USA.

***Mesosmittia patrihortae* Sæther, 1986: 47** [USA: South Carolina]. Andersen and Mendes (2002b: 150) [States of Campeche; Nuevo León; Veracruz]; Ashe and O'Connor (2012a: 371). NT, NE, PA, AF. Widespread.



**Remarks.** Based on material collected in Zurquí, Costa Rica, Epler (2017) could not separate *M. truncata* from *M. patrihortae* Sæther, 1986, and considered *M. truncata* to be a junior synonym of *M. patrihortae*.

**Mesosmittia prolixa Sæther, 1986: 48** [USA: Kansas]. Andersen and Mendes (2002b: 150) [States of Campeche; Nuevo León]; Ashe and O'Connor (2012a: 371). NE. Mexico, USA.

**Mesosmittia tora Sæther, 1986: 50** [USA: South Dakota]. Andersen and Mendes (2002b: 150) [Nuevo León State]; Ashe and O'Connor (2012a: 371). NE. Mexico, USA.

### Genus *Metriocnemus* Wulp, 1874

A genus of 75 named species that occur in all zoogeographic regions except Antarctica and Oceania. Three subgenera are recognized, namely *Metriocnemus* s. str.; *Crymaleomyia* Ashe & O'Connor, 2000; and *Inermipupa* Langton & Cobo, 1997 (see Ashe and O'Connor 2012a). A review of the genus was given by Sæther (1995). Larvae occur in mosses, phytotelmata, springs, ditches, streams and lakes and a few species are hygropetric (Andersen et al. 2013b).

***Metriocnemus* sp.:** Andersen et al. (2000: 591) [Nuevo León State].

### Genus *Nanocladius* Kieffer, 1913

A genus of 37 named species that occur in all zoogeographic regions except Antarctica. Two subgenera are recognized, namely *Nanocladius* s. str., and *Plecopteracoluthus* Steffan, 1965 (see Ashe and O'Connor 2012a). Neotropical species were treated by Wiedenbrug and Silva (2013). Larvae occur in streams, rivers, lakes, and ponds and some are symphoretic on immature Megaloptera and Ephemeroptera (Andersen et al. 2013b).

***Nanocladius* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

### Genus *Onconeura* Andersen & Sæther, 2005

A genus of eight named species that occur in the Neotropical and Nearctic regions. A review of the genus was given by Wiedenbrug et al. (2009), and a cladistic analysis of the genus was given by Donato et al. (2012). The larvae inhabit streams and rivers (Andersen et al. 2013b).

***Onconeura semifimbriata* (Sæther, 1981: 32) (*Thienemanniella*)** [ST. VINCENT]. Andersen and Sæther (2005: 13) [Nuevo León State]; Wiedenbrug et al. (2009: 13); Ashe and O'Connor (2012a: 408). NT. Brazil, Costa Rica, Guatemala, Mexico, St. Vincent.

### Genus *Orthocladius* Wulp, 1874

A genus of ~ 150 named species that occur in the Nearctic, Palaearctic, Afrotropical, and Oriental regions. Six subgenera are recognized, *Orthocladius* s.



str., *Eudactylocladius* Thienemann, 1935; *Euorthocladius* Thienemann, 1935; *Mesorthocladius* Sæther, 2005; *Pogonocladius* Brundin, 1956; and *Symphysio-cladius* Cranston, 1982 (see Ashe and O'Connor 2012a). The genus is recorded from South America based on unnamed larvae from Argentina belonging to the subgenus *Eudactylocladius* (Wais 1987). The larvae inhabit all types of flowing waters, lakes, ponds, swamps, and moist earth; some species also mine submerged wood (Andersen et al. 2013b).

***Orthocladius (Euorthocladius) sp.***: Andersen et al. (2000: 591) [Mexico State].  
***Orthocladius (Orthocladius) sp.***: Andersen et al. (2000: 591) [Mexico State].

#### **Genus *Paralimnophyes* Brundin, 1956**

A genus of five named species that occur in the Nearctic, Palaearctic, Oriental, and Australasian regions. The only species with described larvae inhabits eutrophic lowland pools and ditches (Andersen et al. 2013b).

***Paralimnophyes sp.***: Andersen et al. (2000: 591) [Puebla State]; Contreras-Ramos et al. (2000: 25) [Campeche State].

#### **Genus *Parametriocnemus* Goetghbuer, 1932**

A genus of 35 named species that occur in all zoogeographic regions except Antarctica and the Neotropical region. The genus is recorded from South America based on unnamed larvae from Brazil, Colombia, Peru, and Venezuela (Roback and Coffman 1983; Ospina-Torres et al. 1999; Trivinho-Strixino 2011). Larvae of *Parametriocnemus* are found in springs and in relatively fast flowing cold streams and rivers (Andersen et al. 2013b).

***Parametriocnemus sp.***: Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Bogan et al. (2014: 2726) [Sonora State].

#### **Genus *Paratrachocladius* Santos Abreu, 1918**

See: *Cricotopus* Wulp, 1874.

#### **Genus *Prodiamesa* Kieffer, 1906**

A genus of six named species distributed in the Nearctic and Palaearctic regions. Larvae of *Prodiamesa* occur in springs, streams, rivers, ponds, and the littoral zone in lakes (Sæther and Andersen 2013b).

***Prodiamesa sp.***: Granados-Ramírez et al. (2017: 45) [Morelos State].

#### **Genus *Psectrocladius* Kieffer, 1906**

A genus with > 60 named species that occur in all zoogeographic regions, except Antarctica, Australasia, Oceania, and the Neotropical region. Four subgenera are recognized, namely *Psectrocladius* s. str.; *Allopsectrocladius* Wülker,



1956; *Mesopsectrocladius* Laville, 1972; and *Monopsectrocladius* Wülker, 1956 (see Ashe and O'Connor 2012a). The only record from South America is an unnamed larval morphotype from the Peruvian Amazon belonging to subgenus *Psectrocladius* (Roback 1966). The larvae are eurytopic (Andersen et al. 2013b).

***Psectrocladius* sp.:** Andersen et al. (2000: 591) [Puebla State]; Bogan et al. (2014: 2726) [Sonora State].

### Genus *Pseudosmittia* Edwards, 1932

A genus of > 100 described species that occur in all zoogeographic regions, except Antarctica. Andersen et al. (2010) reviewed the Neotropical species, and a revision of the genus was given by Ferrington and Sæther (2011). Most larvae appear to be semiterrestrial to semiaquatic (Andersen et al. 2013b).

***Pseudosmittia forcipata* (Goetghebuer, 1921; 87) (*Camptocladius*)** [BELGIUM]. Andersen et al. (2010: 39) [States of Campeche; Nuevo León]; Ferrington & Sæther (2011: 297); Ashe and O'Connor (2012a: 545). NT, NE, PA, OR. Widespread.

***Pseudosmittia invirgata* Andersen, Sæther & Mendes, 2010: 43** [MEXICO: Campeche State, Calakmul Biosphere Reserve]. Ferrington and Sæther (2011: 288); Ashe and O'Connor (2012a: 547). Endemic.

***Pseudosmittia joaquimvenancioi* (Messias & Oliveira, 2000: 189) (*Bryophaenocladius*)** [BRAZIL]. Wang et al. (2006: 19); Andersen et al. (2010: 45) [States of Campeche; Veracruz]; Ferrington and Sæther (2011: 184); Ashe and O'Connor (2012a: 547). NT. Brazil, Costa Rica, Mexico, Nicaragua, St. Lucia, St. Vincent, Venezuela.

### Genus *Rheocricotopus* Brundin, 1956

A genus of ~ 75 described species that occur in all zoogeographic regions except Antarctica and Oceania. Two subgenera are recognized, namely *Rheocricotopus* s. str., and *Psilocricotopus* Sæther, 1986 (see Ashe and O'Connor 2012a). The first named species from the Neotropical region, *Rheocricotopus* (*Psilocricotopus*) *sirventorum* Andersen & Mendes, was recently described from Brazil by Andersen and Mendes (2012). Larvae are rheophilic, living on plants and stones in streams and rivers, and are rarely found in the littoral zone of lakes (Andersen et al. 2013b).

***Rheocricotopus* sp.:** Andersen et al. (2000: 589) [Mexico State].

### Genus *Smittia* Holmgren, 1869

A species-rich genus with > 80 named species that occur in all zoogeographic regions except Antarctica. Most larvae are terrestrial, occurring in damp soil, but at least one species is aquatic (Andersen et al. 2013b).

***Smittia* sp.:** Andersen et al. (2000: 591) [Baja California Sur State]; Hamerlík et al. (2018: 217) [Yucatán State].



### Genus *Synorthocladius* Thienemann, 1935

A genus of eight named species that occur in all zoogeographic regions except Antarctica. The larvae inhabit springs, small to large bodies of flowing water and small bodies or shallow parts of still water (Andersen et al. 2013b).

***Synorthocladius semivirens* (Keiffer, 1909: 48) (*Dactylocladius*)** [GERMANY]. Andersen et al. (2000: 589) [Mexico State]; Ashe and O'Connor (2012a: 610). NE, PA, OR. Widespread.

### Genus *Thienemanniella* Kieffer, 1911

A genus of ~ 55 named species that occur in all zoogeographic regions except Antarctica. The Neotropical species were reviewed by Wiedenbrug et al. (2013). The larvae occur in most lotic habitats, from fast-flowing streams to slow-flowing ditches and rivers (Andersen et al. 2013b).

***Thienemanniella* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State]; Bogan et al. (2014: 2726) [Sonora State]; Granados Ramírez et al. (2017: 45) [States of Mexico; Morelos].

### Subfamily Prodiamesinae

See Subfamily Orthocladiinae.

### Subfamily Tanypodinae

#### Genus *Ablabesmyia* Johannsen, 1905

A genus of nearly 100 described species that occur in all zoogeographic regions, except Antarctica; it is currently the most speciose genus in Tanypodinae. Four subgenera, *Ablabesmyia* s. str., *Asaya* Roback, 1985, *Karelia* Roback, 1971, and *Sartaia* Roback, 1983 are recognized (see Ashe and O'Connor 2009). Most Neotropical species probably belong in *Ablabesmyia* s. str., but as pointed out by several authors, many South American species cannot be assigned to a subgenus with certainty, as there are inconsistencies in the establishment of these groups (see Neubern et al. 2013). Many of the recently described species are thus not assigned to a subgenus. The Neotropical species were reviewed by Neubern et al. (2013). The larvae occur in a wide variety of habitats, including small and large standing and flowing waters from cold temperate to warm tropical climate zones (Cranston and Epler 2013).

***Ablabesmyia* (*Karelia*) *cinctipes* (Johannsen, 1946: 271) (*Pentaneura*)** [USA: Florida]. Andersen et al. (2000: 589) [States of Chiapas; Guerrero]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]; Ashe and O'Connor (2009: 121); Cranston and Epler (2013: 62). NT, NE. Bahamas, Belize, Guatemala, Mexico, St. Vincent, USA.



### **Genus *Alotanypus* Roback, 1971**

A genus of 11 described species distributed in the Neotropical, Nearctic, Palaearctic, and Australasian regions. Larvae occur in both standing and flowing waters and appear to tolerate a broad range of conditions including very acid waters (Cranston and Epler 2013).

***Alotanypus* sp.:** Andersen et al. (2000: 591) [Nuevo León State].

### **Genus *Apsectrotanypus* Fittkau, 1962**

A genus of seven named species that occur in all zoogeographic regions except Antarctica and Oceania. In South America unnamed species are recorded from Argentina and Colombia (Donato et al. 2008b; Ruiz-Moreno et al. 2000; Spies and Reiss 1996). The larvae inhabit small, cool, flowing waters (Cranston and Epler 2013).

***Apsectrotanypus* sp.:** Bogan et al. (2014: 2725) [Sonora State].

### **Genus *Clinotanypus* Kieffer, 1913**

A genus of ~ 45 described species that occur in all zoogeographic regions, except Antarctica. Two subgenera are recognized, *Clinotanypus* s. str. and *Apon-teus* Roback, 1971 (see Ashe and O'Connor 2009.) The Neotropical species were reviewed by Neubern et al. (2014). The larvae prefer soft sediments in shallow, warm water bodies including ponds, lakes and slow-flowing streams and rivers (Cranston and Epler 2013).

***Clinotanypus* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche State].

### **Genus *Coelotanypus* Kieffer, 1913**

A genus of ~ 20 described species that occur in the Neotropical, Nearctic, Afrotropical, and Australasian regions. A key to the males of the Neotropical species was given by Paggi and Zilli (2018). The larvae inhabit benthic sediments of lakes, including artificial impoundments, slow flowing reaches of rivers and old riverbeds (Cranston and Epler 2013). The genus can be very abundant in Amazonian flood-plain lakes and in wetlands in southern Brazil (Fonseca Leal et al. 2004; Panatta et al. 2007).

***Coelotanypus atus* Roback, 1971: 37** [USA: Texas]. Andersen et al. (2000: 589) [Mexico, without specific locality]; Ashe and O'Connor (2009: 140). NT, NE. Mexico, Puerto Rico, USA.

***Coelotanypus concinnus* (Coquillett, 1895: 308) (*Tanypus*)** [USA: Texas]. Andersen et al. (2000: 589) [Sonora State]; Ashe and O'Connor (2009: 141). NT, NE. Costa Rica, Mexico, Nicaragua, Puerto Rico, USA.

***Coelotanypus naelis* Roback, 1963: 170** [SURINAM]. Andersen et al. (2000: 589) [Veracruz State]; Ashe and O'Connor (2009: 142). NT, NE. Mexico, Panama, Surinam, USA.

***Coelotanypus olmecus* Roback, 1965: 33** [MEXICO: Veracruz State]. Andersen et al. (2000: 589); Ashe and O'Connor (2009: 142). NT. Mexico, Nicaragua.

***Coelotanypus scapularis* (Loew, 1866: 2) (*Tanypus*)** [USA: Washington]. Andersen et al. (2000: 589) [MEXICO, without specific locality]; Ashe and O'Connor (2009: 142). NT, NE. Canada, Mexico, Panama, USA.

***Coelotanypus toltecus* Roback, 1965: 32** [MEXICO: Veracruz State]. Andersen et al. (2000: 589); Ashe and O'Connor (2009: 142). Endemic.

***Coelotanypus tricolor* (Loew, 1861: 309) (*Tanypus*)** [USA: New York]. Andersen et al. (2000: 589) [Veracruz State]; Ashe and O'Connor (2009: 143). NT, NE. Costa Rica, Mexico, USA.

### Genus *Djalmabatista* Fittkau, 1968

A genus of 15 described species that occur in all zoogeographic regions except Antarctica and Oceania. The larvae appear to prefer low alkalinity to weakly acid waters, and may be found in lakes, ponds, springs, large and small rivers, as well as in temperate to tropical lentic and lotic depositional habitats (Cranston and Epler 2013).

***Djalmabatista pulchra* (Johannsen, 1908: 273) (*Protenthes*)** [USA: New York]. Andersen et al. (2000: 589) [States of Chiapas; Guerrero]; Ashe and O'Connor (2009: 155). NT, NE. Argentina (Oca et al. 2020), Bahamas (Anderson et al. 2014), Brazil, Canada, Costa Rica, Guatemala, Mexico, Nicaragua, USA.

### Genus *Fittkauimyia* Karunakaran, 1969

A genus of eight named species that occur in all zoogeographic regions except Antarctica and Oceania. The larvae inhabit rivers and the littoral zone of lakes, generally in tropical and subtropical regions (Cranston and Epler 2013).

***Fittkauimyia* sp.:** Andersen et al. (2000: 591) [States of Campeche; Nuevo León]; Contreras-Ramos and Andersen (1999: 4); Contreras-Ramos et al. (2000: 25); Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"]; Bogan et al. (2014: 2725) [Sonora State]; Hamerlík et al. (2018: 217) [States of Quintana Roo; Yucatán].

### Genus *Labrundinia* Fittkau, 1962

A genus of ~ 40 named species distributed in the Neotropical, Nearctic, Palearctic, and Oriental regions. The genus was revised by Silva et al. (2014). The larvae live in small, standing water bodies as well as in streams and rivers (Cranston and Epler 2013).

***Labrundinia fosteri* Roback, 1987: 2018** [COLOMBIA]. Vinogradova and Riss (2007 33) ["Yucatan Peninsula"]; Ashe and O'Connor (2009: 164); Silva et al. (2014: 44). NT. Colombia, Mexico.

***Labrundinia longipalpis* (Goetghebuer, 1921: 66) (*Tanypus*)** [BELGIUM].

Syn.: *Labrundinia maculata* Roback, 1971: 278 [USA: California] (Silva et al. 2011: 294).



Andersen et al. (2000: 589) [Coahuila State]; Ashe and O'Connor (2009: 165, 2012b: 127) [Michoacán State]; Silva et al. (2011: 295, 2014: 67). NT, NE, PA. Widespread.

***Labrundinia pilosella* (Loew, 1866: 5) (*Tanypus*)** [USA: District Columbia]. Andersen et al. (2000: 589) [Puebla State]; Ashe and O'Connor (2009: 166); Silva et al. (2014: 127). NT, NE. Canada, Guatemala, Honduras, Mexico, Puerto Rico, Trinidad and Tobago, USA, Venezuela.

#### **Genus *Larsia* Fittkau, 1962**

A genus of ~ 30 named species that occur in all zoogeographic regions except Antarctica. Neubern and Silva (2011) described two new species from the Neotropical region and presented a checklist of the *Larsia* species of the world. In the Southern Hemisphere the larvae are associated with both lotic and lentic warm waters (Cranston and Epler 2013).

***Larsia planensis* (Johannsen, 1946: 284) (*Pentaneura*)** [USA: Texas]. Andersen et al. (2000: 589) [Mexico City and States of Morelos; Oaxaca; Veracruz]; Ashe and O'Connor (2009: 169). NT, NE, OC. Canada, Guatemala, Hawaiian Islands, Mexico, USA.

#### **Genus *Natarsia* Fittkau, 1962**

A genus of six named species distributed in the Nearctic, Palearctic, and Oriental regions. The larvae of the North American species live in small running waters, perhaps favoring cool water. European species inhabit streams, springs, and the littoral zone of montane or northern lakes and show hygropetric behavior in small, standing waters (Cranston and Epler 2013).

***Natarsia* sp.:** Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

#### **Genus *Nilotanypus* Kieffer, 1923**

A genus of 11 named species distributed in all zoogeographical regions except Antarctica and Oceania. Andersen and Pinho (2019) recently described two new species of *Nilotanypus* from Brazil. The larvae inhabit flowing waters, especially areas with sandy beds (Cranston and Epler 2013).

***Nilotanypus* sp.:** Contreras-Ramos and Andersen (1999: 4) [Campeche]; Vinogradova and Riss (2007: 33) ["Yucatan Peninsula"].

#### **Genus *Paramerina* Fittkau, 1962**

See: *Zavreliomyia* Fittkau, 1962.

#### **Genus *Pentaneura* Philippi, 1866**

A genus of eight named species distributed in the Neotropical and Nearctic regions. Silva and Ferrington (2018) recently reviewed the Neotropical species.

The larvae inhabit a variety of aquatic systems, from small streams and ponds to lakes and bays, occasionally the larvae live in shallow water flowing over bedrock covered with moss, algae, and detritus (Silva and Ferrington 2018).

***Pentaneura inconspicua* (Malloch, 1915: 371) (*Tanypus*)** [USA: Illinois]. Andersen et al. (2000: 589) [Mexico City]; Ashe and O'Connor (2009: 195). NE. Canada, Mexico, USA.

#### Genus *Procladius* Skuse, 1889

The second most speciose genus of Tanypodinae, with ~ 70 named species that occur in all zoogeographical regions except Antarctica. Four subgenera are recognized, namely *Procladius* s. str., *Holotanypus* Roback, 1982, *Laurotanypus* Oliveira, Messias & Silva-Vasconcellos, 1992, and *Psilotanypus* Kieffer, 1906 (see Ashe and O'Connor 2009; Dantas and Hamada 2018). The larvae prefer muddy substrate of standing or slow-flowing water bodies, especially ponds and small lakes, but a few also inhabit the profundal zone of large, deep lakes (Cranston and Epler 2013).

***Procladius (Psilotanypus) bellus* (Loew, 1866: 4) (*Tanypus*)** [USA: Washington]. Andersen et al. (2000: 589) [Mexico City]; Ashe and O'Connor (2009: 210); Bentley and Thomas (2022) [Puebla State]. NE, OR. Canada, China, Mexico, USA.

***Procladius (Holotanypus) culiciformis* (Linnaeus, 1767: 978) (*Tipula*)** [SWEDEN]. Andersen et al. (2000: 589) [Mexico City]; Ashe and O'Connor (2009: 199). NE, PA. Widespread.

**Remarks.** The species was recorded from Campeche State by Mendoza-Arroyo and López-Toledo (2017: 27). This record is doubtful as the specimen was studied using a stereomicroscope with too low magnification to observe morphological details and no experts were involved in the identification of the specimen.

#### Genus *Psectrotanypus* Kieffer, 1909

A genus with seven named species that occur in the Nearctic, Palaearctic, Afrotropical, and Oriental regions. The genus was recorded from the Neotropical region by Fittkau and Reiss (1979), but without specifying a country. The larvae occur in ponds, bogs, small bodies of water and slow-flowing streams (Cranston and Epler 2013).

***Psectrotanypus* sp.:** Alcocer et al. (2016: 411) [Puebla State].

#### Genus *Tanypus* Meigen, 1803

A genus of > 30 named species that occur in all zoogeographic regions except Antarctica and Oceania. Two subgenera are recognized, namely *Tanypus* s. str. and *Apelopia* Roback, 1971 (see Ashe and O'Connor 2009). The larvae live in sediments in standing and slowly flowing waters, especially in temperate to warm regions, where they can tolerate high salinity (Cranston and Epler 2013).

***Tanypus (Tanypus) catemaco* (Roback, 1964: 141) (*Pelopio*)** [MEXICO: Veracruz State]. Andersen et al. (2000: 589); Ashe and O'Connor (2009: 227). Endemic.



***Tanypus (Apelopia) neopunctipennis* Sublette, 1964b: 118** [USA: Illinois]. Andersen et al. (2000: 589) [States of Oaxaca; Veracruz]; Ashe and O'Connor (2009: 226). NT, NE. Bahamas, Cuba (Bello-González and Téllez-Martínez 2012), Mexico, USA.

#### **Genus *Thienemannimyia* Fittkau, 1957**

A genus of ~ 20 named species occurring in the Nearctic, Palaearctic, Afrotropical, and Oriental regions. Unnamed species were reported from Costa Rica by Watson and Heyn (1993). The larvae are found in both lotic and lentic waters (Cranston and Epler 2013).

***Thienemannimyia* sp.:** Andersen et al. (2000: 591) [Nuevo León State].

#### **Genus *Zavrelimyia* Fittkau, 1962**

Syn.: *Paramerina* Fittkau, 1962.

Recently Silva and Ekrem (2016) formally placed the genus *Paramerina* Fittkau as a synonym of *Zavrelimyia* Fittkau. The genus now comprises ~ 50 named species that occur in all zoogeographic regions except Antarctica. Larvae of *Zavrelimyia* s. str. are, with few exceptions, more or less cold stenothermic and in temperate regions of the Holarctic primarily inhabitants of sandy or detritus rich sediments of springs and lentic habitats of stream sections close to springs. Larvae of *Zavrelimyia* (*Paramerina*) are eurythermic, living in a variety of standing waters of all sizes, but are also present in small lotic habitats including pools in rivers (Cranston and Epler 2013).

***Zavrelimyia (Paramerina) smithae* (Sublette, 1964b: 100) (*Pentaneura* (*Pentaneura*))** [USA: California]. Andersen et al. (2000: 589) [States of Oaxaca; Puebla]; Ashe and O'Connor (2009: 192). NE. Mexico, USA.

#### **Generically unplaced valid *Macropelopiini***

***roblesi* Vargas, 1946: 80 (*Macropelopia*)** [MEXICO: Chiapas State, Mariscal]. Andersen et al. (2000: 589 as *Macropelopia roblesi* Vargas); Ashe and O'Connor (2009: 250, 362). Endemic.

#### **Generically unplaced valid *Tanypodinae***

***marmorata* Johannsen, 1938: 219 (*Pentaneura*)** [PUERTO RICO]. Andersen et al. (2000: 589 as *Pentaneura marmorata* Johannsen) [States of Chiapas; Guerrero; Veracruz]; Ashe and O'Connor (2009: 252). NT. Mexico, Puerto Rico.

#### **Subfamily *Telmatogetoninae***

##### **Genus *Telmatogeton* Schiner, 1867**

A genus of ~ 30 named species that occur in all zoogeographic regions. Except for a few freshwater species from Hawaii, *Telmatogeton* larvae are marine and

live in the intertidal zone where they construct tubes within green algae such as *Enteromorpha* (Cranston and Ashe 2013).

***Telmatogeton alaskensis* Coquillett, 1900: 395** [USA: Alaska]. Andersen et al. (2000: 589) [MEXICO, without specific locality]; Ashe and O'Connor (2009: 332). NE. Canada, Mexico, USA.

***Telmatogeton latipenne* Wirth, 1949: 172** [MEXICO: Colima State, Revillagigedo Islands]. Andersen et al. (2000: 589); Ashe and O'Connor (2009: 333). Endemic.

### Genus *Thalassomya* Schiner, 1856

A genus of 12 named species that occur in all zoogeographic regions except Antarctica. The larvae live in the intertidal marine zone, particularly in the warmer seas of the world (Cranston and Ashe 2013).

***Thalassomya bureni* Wirth, 1949: 167** [USA: Florida]. Andersen et al. (2000: 589) [Baja California Sur State]; Ashe and O'Connor (2009: 336). NT, NE. Mexico, USA. According to Wirth (1969) distributed "from Florida to Panama and the West Indies".

***Thalassomya longipes* (Johnson, 1924: 86) (*Galapagomyia*)** [ECUADOR: Galapagos Islands]. Andersen et al. (2000: 589) [Nayarit State: Tres Marias Islands]; Ashe and O'Connor (2009: 337). NT. Ecuador, Mexico.

***Thalassomya pilipes* Edwards, 1928: 60** [AMERICAN SAMOA]. Andersen et al. (2000: 589) [Baja California State; Colima State: Revillagigedo Islands]; Ashe and O'Connor (2009: 338). NT, NE, OR, AU, OC. Widespread.

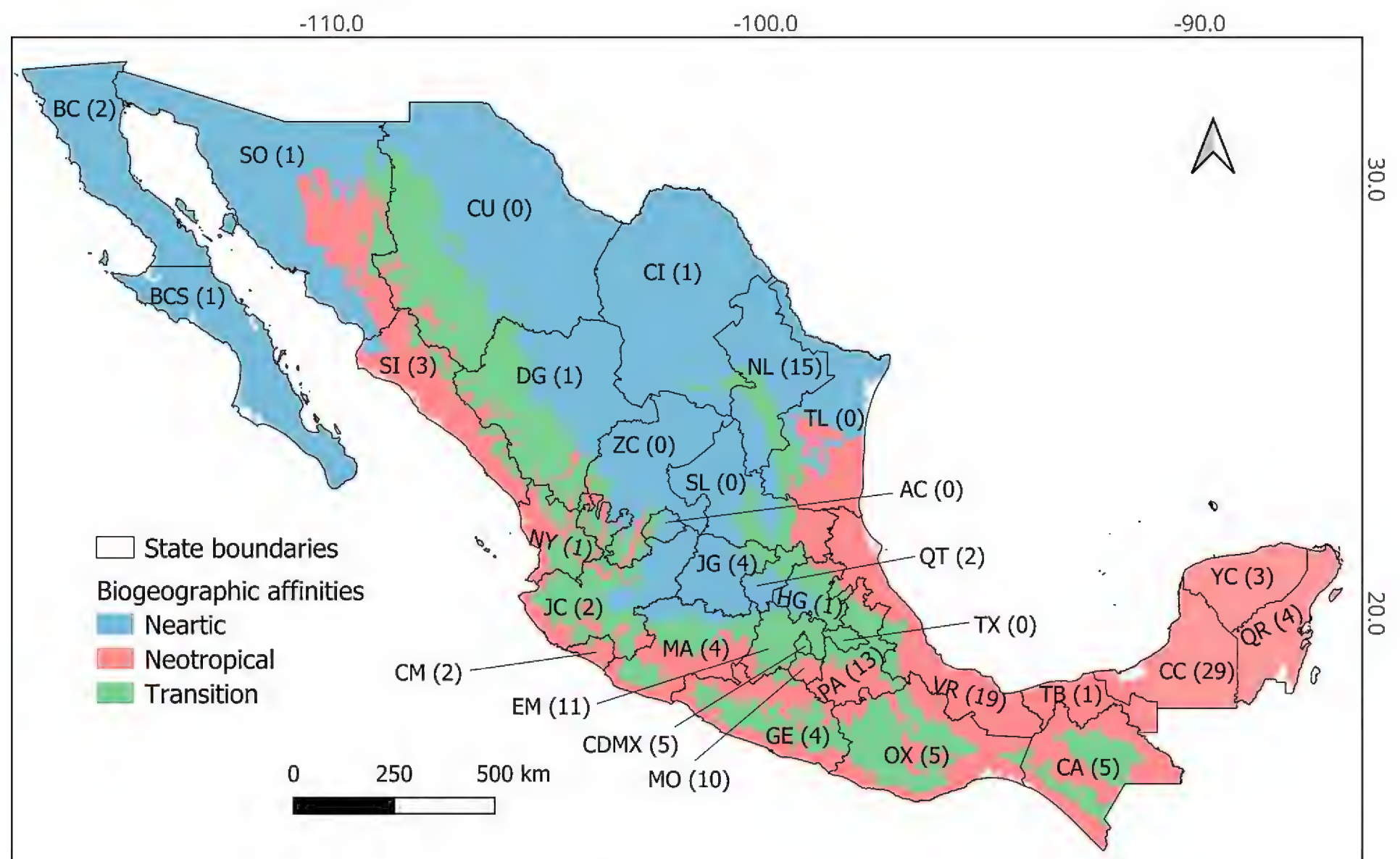
### Species richness and taxonomic composition

A total of 110 species are listed for Mexico; 52 species in 25 genera belong to the subfamily Chironominae, 30 species in 13 genera to Orthocla-diinae, 19 species in nine genera and two valid species that are not placed in a genus to Tanypodinae, five species in two genera to Telmatogetoninae, and two species in one genus to Diamesinae. In addition, there are records of 41 genera without identified species. Of these, 20 genera belong to Chironominae, 12 to Orthocla-diinae, eight to Tanypodinae, and one genus to Diamesinae.

### Distribution

The number of species recorded from the different states throughout Mexico is very uneven. More than ten species have only been recorded from six states. From Campeche a total of 29 species are recorded, most of them based on material collected during a project in Calakmul Biosphere Reserve (Contreras Ramos et al. 2000). From Veracruz 19 species have been recorded, from Nuevo León 15 species, from Puebla 13 species, from the State of Mexico 11 species and from Morelos ten species. From the remaining states only five or less species have been recorded. In most of the states in central and northern Mexico, as well as those on the Pacific coast, there are no or only a few records (Fig. 1).





**Figure 1.** Biogeographic affinities and number of chironomid species recorded from each of the 32 Mexican states. Abbreviations: AC: Aguascalientes; BC: Baja California; BCS: Baja California Sur; CA: Chiapas; CC: Campeche; CDMX: Ciudad de México; CI: Coahuila; CM: Colima; CU: Chihuahua; DG: Durango; EM: Estado de México; GE: Guerrero; GJ: Guanajuato; HG: Hidalgo; JC: Jalisco; MA: Michoacán; MO: Morelos; NL: Nuevo León; NY: Nayarit; OX: Oaxaca; PA: Puebla; QR: Quintana Roo; QT: Querétaro; SI: Sinaloa; SL: San Luis Potosí; SO: Sonora; TB: Tabasco; TL: Tamaulipas; TX: Tlaxcala; VR: Veracruz; YC: Yucatán; ZC: Zacatecas.

The type localities for 34 Chironomidae species are in Mexico; of these, 27 species (25% of the total number of recorded species) are endemic. Twenty-nine species have a Neotropical distribution, 15 are Nearctic or Holarctic, while the remaining 39 species are distributed in both the Neotropical and Nearctic regions or are more widely distributed.

## Discussion

In addition to being key to freshwater and riparian ecosystems (e.g., Porinchu and MacDonald 2003; Paetzold et al. 2005), chironomids have been widely used to recreate the environmental history of lakes and rivers (e.g., Pliik et al. 2019), generate typologies (e.g., Schöll and Haybach 2004; Nyman and Korhola 2005), propose biogeographical hypotheses (e.g., Brundin 1966; Krosch et al. 2011), ecotoxicological models (e.g., Beleza et al. 2019; Ferrari et al. 2019), bio-monitoring (e.g., Gomes et al. 2018; Molineri et al. 2020) and for the evaluation of taxonomic and functional diversity (e.g., Jyväskylä et al. 2018). However, the Mexican Chironomidae fauna needs to be much better studied before it can be useful in such contexts.

In the previous checklist (Andersen et al. 2000), the number of species listed was 61; so, 49 species have been added during the last two decades. Of these, no less than 25 species belong to the subfamily Orthoclaadiinae, and the number

of Orthocladiinae species has thus increased five times from the five species recorded in 2000. In Chironominae the number of species has increased from 29 species in 2000 to 52 species today; while in the subfamilies Tanypodinae, Telmatogetoninae, and Diamesinae no species have been added since 2000.

Comparing the number of Chironomidae species recorded in Mexico with the number in other neighboring, better studied areas, highlights the need for further studies in Mexico. Oliver et al. (1990) and Oliver and Dillon (1994) listed 206 generic and 1065 species names of Nearctic Chironomidae. More than 700 species of chironomids are listed from southeastern USA, including Alabama, Florida, Georgia, North and South Carolina, and Tennessee, which together comprise approximately 41% of the total area of Mexico (Caldwell et al. 1997). For the state of California, bordering Mexico and comprising ~ 22% of the area of Mexico, 245 species of chironomids have been recorded (Spies 1999). More than 400 species have been recorded from the state of Florida, which comprises less than 9% of the total area of Mexico (Epler 2019).

No comprehensive checklist for the Neotropical region has been published since Spies and Reiss (1996). However, in an updated checklist for Brazil (Pinho 2022) 658 species in 99 genera are listed. Mendes and Pinho (2016) recently published a checklist for Colombia listing only 30 species of Chironomidae in 16 genera in three subfamilies. In addition, 32 genera and two subfamilies have been recorded from Colombia based on larva, but without identified species.

The 110 species recovered in the present checklist is far from the 1000 species estimated by Andersen et al. (2000) to occur in Mexico and highlights the need for further studies. Most additional species to be found will undoubtedly belong to the subfamilies Chironominae, Orthocladiinae, and Tanypodinae. Chironominae is the most species rich subfamily of Chironomidae and is found in all biogeographical regions except Antarctica. Additional species will mainly be found in slow flowing streams and rivers, lakes and ponds in lowland habitats, but additional species will also be found in streams, rivers and lakes at higher altitudes. Mexican species of some genera, like e.g. *Rheotanytarsus* Thienemann & Bause, 1913 have been reviewed and new species described. However, there are several species-rich genera in which Mexican material has not or hardly been studied and in genera like *Pseudochironomus* Malloch, 1915, *Tanytarsus* Wulp, 1874, and *Polypedilum* Kieffer, 1912, many more species are likely to be added. The Orthocladiinae is also a very species-rich and widely distributed subfamily that tends to be particularly abundant in streams and rivers in mountainous areas. For some genera, like *Antillocladius* Sæther, 1981, *Bryophaenocladus* Thienemann, 1934 and *Mesosmittia* Brundin, 1956, Mexican material has been included in reviews of the genera, while other species-rich genera like *Corynoneura* Winnertz, 1846 and *Cricotopus* Wulp, 1874, are hardly studied at all. Most additional Tanypodinae species will probably be found in slow flowing streams and rivers, lakes and ponds in lowland habitats. So far only a few genera of Tanypodinae have been studied in detail in Mexico and for several species-rich genera like *Ablabesmyia* Johannsen, 1905 and *Labrundinia* Fittkau, 1962, there are only a few species recorded from Mexico so far.

Particularly in Orthocladiinae, several recently described genera like *Colosmittia* Andersen & Sæther, 1994, *Litocladus* Mendes, Andersen & Sæther, 2004, and *Titimbera* Andersen, Pinho & Mendes, 2015 might also occur in Mexico as they have all been taken in Costa Rica (Andersen et al. 2011a; Mendes et al. 2011; Andersen et al. 2015). There might well be several undescribed genera



in the subfamily. Epler (2017) recently recorded no less than 16 undescribed genera of Orthocladiinae from Zurquí in Costa Rica.

Additional species will also likely be found in some of the less species-rich subfamilies. Today, ten extant subfamilies of Chironomidae are recognized. Six subfamilies occur in the Nearctic region, while in the Neotropical region no fewer than nine subfamilies have been encountered. At the subfamily level the Neotropical region is thus the most diverse biogeographical region. Only the monotypic subfamily Usambaromyiinae Andersen & Sæther has not been recorded. In the Neotropical region two of the other subfamilies, Chilonomyiinae Brundin and Aphroteninae Brundin, have only been found in southern Chile and Patagonia and it is unlikely that any species in these two subfamilies occur in Mexico.

However, two subfamilies so far not recorded from Mexico might occur in the country. The subfamily Buchonomyiinae Brundin & Sæther with three included species is found in the Neotropical, Palaearctic, and Oriental regions. It was recorded for the first time from the Neotropical region by Andersen and Sæther (1995) describing *Buchonomyia brundini* Andersen & Sæther, 1995 from a small, shallow, rather fast-flowing river in Costa Rica. The subfamily Podonomiinae Thienemann & Edwards has a mainly bipolar distribution with five genera and 15 species in North America and Canada, and five genera with altogether 85 species in the southern part of South America. Spies (1999) recorded two species of *Boreochlus* Edwards, 1938 and one species of *Parochlus* Enderlein, 1912 from California. Several species have recently also been described from Brazil, and two genera, *Podonomus* Philippi, 1866 and *Parochlus*, are listed from Colombia based on larvae (Mendes and Pinho 2016; Pinho 2022).

The subfamily Telmatogetoninae with two genera, *Telmatogeton* Schiner, 1867 and *Thalassomya* Schiner, 1856, is marine. Both genera with altogether five species are known from Mexico.

The subfamily Diamesinae has a mainly arctic or alpine distribution with 55 species in ten genera in the Nearctic region and 11 species in five genera in the Neotropical region. Two species of *Diamesa* Meigen, 1835 were described by Serra-Tosio (1977) from a high-altitude lake in the Mexico State. The genus, with 107 species, is known from the Nearctic, Palaearctic, Afrotropical, and Oriental regions. Spies (1999) listed six species of *Diamesa* from California and one species in each of the genera *Pseudodiamesa* Goethgebuer, 1939 and *Sympotthastia* Pagast, 1947. Based on larvae, Mendes and Pinho (2016) listed the genus *Paraheptagyia* Brundin, 1966 from Colombia. *Paraheptagyia*, with five species, is distributed in the southern part of the Neotropical region and two species occur in the Australasian region (Ashe and O'Connor 2009).

The uneven distribution of Chironomidae records throughout the states in Mexico clearly reflects the lack of Chironomidae studies. Some Nematocera groups are better studied than the Chironomidae in Mexico. Consideration of the general distribution patterns of these groups may suggest what can be expected for the chironomids. States like Oaxaca and Chiapas are among the richest when it comes to Culicidae, Simuliidae and Ceratopogonidae (Ibáñez-Bernal and Coscarón 1996; Ibáñez-Bernal et al. 1996). Bond et al. (2014) also demonstrated that the Pacific slope has a high diversity of aquatic insects. Climatic and topographic heterogeneity in southeastern Mexico leads to high environmental heterogeneity (Rodríguez et al. 2019). The area has a complex geology resulting in barriers such as the Isthmus of Tehuantepec that is responsible for increased diversity in several insect groups (Halfpeter and

Morrone 2017). It is expected that future studies will show that the increase in the number of Chironomidae species will be particularly striking in Oaxaca and Chiapas.

Mexico is known to have a high proportion of endemic species. In well-studied groups like amphibians, reptiles, and mammals the proportion of endemic species is 60%, 51% and 31%, respectively (Hufnagel and Mics 2021). However, the number of records of chironomids from Mexico is clearly insufficient to appreciate patterns of endemism or clear biogeographic relationships.

To increase the number of species recorded from Mexico, taxonomic studies should be given priority. Even though rearing of larvae is important to associate the immatures with adults, chironomids are generally described based on adult males. To achieve an immediate increase in species numbers, further studies should thus focus on adults rather than on larvae and pupae. Fieldwork should be focused particularly on the states in central and northern Mexico, where the chironomid fauna is poorly known. The southeastern states along the Pacific coast should also be given special attention. Different habitats such as streams, rivers, lakes, and ponds should be visited, and collections should be made at different altitudes. Several chironomid species live in special habitats, like phytotelmata, and many species particularly among the Orthoclaadiinae, are semiterrestrial or terrestrial.

## Acknowledgements

We are indebted to John Epler in Florida and to Martin Spies in Munich for information and assistance.

## Additional information

### Conflict of interest

The authors have declared that no competing interests exist.

### Ethical statement

No ethical statement was reported.

### Funding

This research would not have been possible without funding from the Consejo Nacional de Ciencia y Tecnología de México (CONACyT) through a doctoral fellowship, the British Ecological Society (Small Research Grant SR21-1220), and the Tonolli Award from the International Limnological Society. Natura y Ecosistemas Mexicanos, A.C. also provided support for this research

### Author contributions

Orestes C. Bello-González: compilation, updating and analysis of information, taxonomic review, writing of the manuscript, preparation of the figure. Trond Andersen: compilation, updating and analysis of information, taxonomic review, writing of the manuscript. Norman Mercado-Silva: writing of the manuscript.

### Author ORCIDs

Orestes C. Bello-González  <https://orcid.org/0000-0002-7697-1618>

Trond Andersen  <https://orcid.org/0000-0003-2201-1870>

Norman Mercado-Silva  <https://orcid.org/0000-0001-7764-8161>



## Data availability

All of the data that support the findings of this study are available in the main text.

## References

- Acosta R, Prat N, Ribera C, Michailova P, Hernández-Fonseca MDC, Alcocer J (2017) *Chironomus alchichica* sp. n. (Diptera: Chironomidae) from Lake Alchichica, Mexico. *Zootaxa* 4365(1): 53–70. <https://doi.org/10.11646/zootaxa.4365.1.3>
- Admin (2022) Entomological collections, University of Bergen (UiB). [Occurrence dataset] <https://doi.org/10.15468/irppio> [Accessed via GBIF.org on November 21<sup>th</sup>, 2022]
- Alcocer J, Lugo A, Estrada S, Ubeda M, Escobar E (1993) La macrofauna bentónica de los axalapazcos Mexicanos. *Actas Congreso Español de Limnología* 6: 409–415.
- Alcocer J, Escobar E, Rezníčková P, Oseguera LA (2016) La comunidad de macroinvertebrados bentónicos litorales como un reflejo de la heterogeneidad ambiental. *Hidrobiológica* 26: 403–418. <https://doi.org/10.24275/uam/izt/dcbshidro/2016v26n3/Alcocer>
- Andersen T (2023) A new, darkwinged species of *Pseudochironomus* Malloch, 1915 from Mexico and Costa Rica (Chironomidae: Chironominae, Pseudochironomini). *Aquatic Insects*. <https://doi.org/10.1080/01650424.2023.2243596>
- Andersen T, Hagenlund LK (2017) Two new species of *Antillocladius* Sæther, 1981 from the Amazon rainforest, Brazil (Diptera, Chironomidae, Orthoclaadiinae). *Norwegian Journal of Entomology* 64: 65–71. <http://www.entomologi.no/journals/nje/2017-2/pdf/nje-64-no2-65-71-andersen.pdf>
- Andersen T, Mendes HF (2002a) New species and records of the *Axarus* “rogersi-group” from South and Central America (Diptera, Chironomidae). *Acta Zoologica Academiae Scientiarum Hungaricae* 48: 35–40.
- Andersen T, Mendes HF (2002b) Neotropical and Mexican *Mesosmittia* Brundin, with the description of four new species (Insecta, Diptera, Chironomidae). *Spixiana* 25: 141–155. <https://www.biodiversitylibrary.org/part/66825>
- Andersen T, Mendes HF (2012) A new species of *Rheocricotopus* Brundin from Mato Grosso, Brazil (Diptera: Chironomidae, Orthoclaadiinae). *Biota Neotropica* 12(1): 111–116. <https://doi.org/10.1590/S1676-06032012000100010>
- Andersen T, Pinho LC (2019) Two new species of *Nilotanypus* Kieffer, 1923 (Diptera, Chironomidae, Tanypodinae) from Brazil. *Norwegian Journal of Entomology* 66(1): 11–18. <http://www.entomologi.no/journals/nje/2019-1/pdf/nje-vol66-no1-2019-11-18-andersen.pdf>
- Andersen T, Sæther OA (1995) The first record of *Buchonomyia* Fittkau and the subfamily Buchonomyiinae from the New World (Diptera: Chironomidae). In: Cranston P (Ed.) *Chironomids: from genes to ecosystems*. Proceedings of the 12<sup>th</sup> International Symposium on Chironomidae, Canberra, Australia, January 1994. CSIRO, Australia, 363–367.
- Andersen T, Sæther OA (1996) New species and records of *Beardius* Reiss et Sublette (Diptera: Chironomidae). *Annales de Limnologie* 32(1): 33–44. <https://doi.org/10.1051/limn/1996003>
- Andersen T, Sæther OA (2005) *Onconeura*, a new Neotropical orthoclad genus (Chironomidae, Orthoclaadiinae). *Zootaxa* 957(1): 1–16. <https://doi.org/10.11646/zootaxa.957.1.1>
- Andersen T, Contreras-Ramos A, Spies M (2000) 31. Chironomidae (Diptera). In: Llorente Bousquets J, González Soriano E, Papavero N (Eds) *Biodiversidad, taxonomía y*

- biogeografía de artrópodos de México: hacia una síntesis de su conocimiento. Vol II. Universidad Nacional Autónoma de México, Mexico D.F., 581–591.
- Andersen T, Sæther OA, Mendes HF (2010) Neotropical *Allocladius* Kieffer, 1913 and *Pseudosmittia* Edwards, 1932 (Diptera: Chironomidae). *Zootaxa* 2472(1): 1–77. <https://doi.org/10.11646/zootaxa.2472.1.1>
- Andersen T, Mendes HF, Hagenlund LK (2011a) A new species of *Colosmittia* Andersen et Sæther from Costa Rica (Chironomidae: Orthoclaadiinae). *Biota Neotropica* 11(3): 211–213. <https://doi.org/10.1590/S1676-06032011000300019>
- Andersen T, Sæther OA, Contreras-Ramos A (2011b) New species and records of *Nandeva* Wiedenbrug, Reiss et Fittkau (Chironomidae: Chironominae). *Zootaxa* 3136(1): 45–60. <https://doi.org/10.11646/zootaxa.3136.1.2>
- Andersen T, Cranston PS, Epler JH [Eds] (2013a) Chironomidae (Diptera) of the Holarctic Region, Keys and diagnoses, Part 1 Larvae. *Insect Systematics & Evolution, Supplement* 66: 1–571.
- Andersen T, Sæther OA, Cranston PS, Epler JH (2013b) 9. The larvae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Andersen T, Cranston PS, Epler J (Eds) Chironomidae (Diptera) of the Holarctic Region, Keys and diagnoses, Part 1 Larvae. *Insect Systematics and Evolution, Supplement* 66: 189–386.
- Andersen T, Pinho LC, Mendes H (2015) *Titimbera*, a new genus of Orthoclaadiinae from South and Central America (Diptera: Chironomidae). *Studies on Neotropical Fauna and Environment* 50(2): 96–106. <https://doi.org/10.1080/01650521.2015.1050903>
- Andersen T, Hagenlund LK, Pinho LC (2016) New species and records of Neotropical *Cardiocladius* Kieffer, 1912 (Diptera: Chironomidae, Orthoclaadiinae). *Aquatic Insects* 37(4): 273–286. <https://doi.org/10.1080/01650424.2016.1253850>
- Andersen T, Donato M, Hagenlund LK, Mauad M, Mendes HF (2018) A review of Neotropical *Axarus*, with the description of five new species (Diptera: Chironomidae). *Studies on Neotropical Fauna and Environment* 53(3): 167–183. <https://doi.org/10.1080/01650521.2018.1447337>
- Anderson A, Kranzfelder P, Egan A, Ferrington Jr LC (2014) A survey of Neotropical Chironomidae (Diptera) on San Salvador Island, Bahamas. *The Florida Entomologist* 97(1): 304–308. <https://doi.org/10.1653/024.097.0147>
- Ashe P, O'Connor JP (2009) A world catalogue of Chironomidae (Diptera). Part 1. Buchonomyiinae, Chilenomyiinae, Podonominae, Aphroteniinae, Tanypodinae, Usambaromyiinae, Diamesinae, Prodiamesinae and Telmatogetoninae. Irish Biogeographical Society and National Museum of Ireland, Dublin, 445 pp.
- Ashe P, O'Connor JP (2012a) A world catalogue of Chironomidae (Diptera). Part 2A & 2B. Orthoclaadiinae. Irish Biogeographical Society and National Museum of Ireland, Dublin, 968 pp.
- Ashe P, O'Connor JP (2012b) Additions and corrections to Part 1 of 'A World Catalogue of Chironomidae (Diptera)'. In: Bakken T (Ed.) *Proceedings of the 18<sup>th</sup> International Symposium on Chironomidae*, Trondheim (Norway), July 4–6, 2011. *Fauna Norvegica* 31: 125–136. <https://doi.org/10.5324/fn.v31i0.1366>
- Ashe P, Murray DA, Reiss F (1987) The zoogeographical distribution of Chironomidae (Insecta: Diptera). *Annales de Limnologie* 23(1): 27–60. <https://doi.org/10.1051/limn/1987002>
- Beck WM, Beck EC (1958) A new species of *Xenochironomus* from Florida (Diptera: Chironomidae). *The Florida Entomologist* 41(1): 27–28. <https://doi.org/10.2307/3492631>



- Beleza S, Campos D, Nunes B, Pestana JLT (2019) Ecotoxicological responses of *Chironomus riparius* to *Eucalyptus* and *Alnus* leaf leachates: From biochemical to life-history effects. *Ecological Indicators* 106: 105473. <https://doi.org/10.1016/j.ecolind.2019.105473>
- Bello-González OC, Téllez-Martínez B (2012) First record of *Tanypus neopunctipennis* Sublette, 1964 (Tanypodinae: Chironomidae) from Cuban archipelago. *Boletín de la SEA* 51: 356. <http://www.sea-entomologia.org/PDF/Boletin51/356BSEA51NBTanypusCuba.pdf>
- Bello-González OC, Andersen T, Hagenlund LK (2016) A new species of *Xestochironomus* Sublette & Wirth, 1972 from Cuba (Diptera, Chironomidae). *Norwegian Journal of Entomology* 63: 44–49. <http://www.entomologi.no/journals/nje/2016-1/pdf/nje-vol63-no1-44-49-gonzalez.pdf>
- Bellodi CF, Fusari LM, de Oliveira Roque F (2016) New species and records of *Oukuriella* Epler, 1986 from the Neotropical region (Diptera: Chironomidae). *Zootaxa* 4078(1): 187–196. <https://doi.org/10.11646/zootaxa.4078.1.17>
- Bentley A, Thomas J (2022) Snow Entomological Museum Collection. Version 26.65. University of Kansas Biodiversity Institute. [Occurrence dataset] <https://doi.org/10.15468/fhntpy> [Accessed via GBIF.org on November 18<sup>th</sup>, 2022]
- Bidawid-Kafka N (1996) Zur Kenntnis der neotropischen Arten der Gattung *Polypedilum* Kieffer, 1912 (Diptera, Chironomidae). Teil II. *Entomofauna* 17: 165–240.
- Bogan MT, Noriega-Felix N, Vidal-Aguilar SL, Findley LT, Lytle DA, Gutiérrez-Ruacho OG, Alvarado-Castro JA, Varela-Romero A (2014) Biogeography and conservation of aquatic fauna in spring-fed tropical canyons of the southern Sonoran Desert, Mexico. *Biodiversity and Conservation* 23(11): 2705–2748. <https://doi.org/10.1007/s10531-014-0745-z>
- Bond JG, Casas-Martínez M, Quiroz-Martínez H, Novelo-Gutiérrez R, Marina CF, Ulloa A, Orozco-Bonilla A, Muñoz M, Williams T (2014) Diversity of mosquitoes and the aquatic insects associated with their oviposition sites along the Pacific coast of Mexico. *Parasites & Vectors* 7(41): 1–19. <https://doi.org/10.1186/1756-3305-7-41>
- Borkent A (1984) The systematics and phylogeny of the *Stenochironomus* complex (*Xestochironomus*, *Harrisius*, and *Stenochironomus*) (Diptera: Chironomidae). *Memoirs of the Entomological Society of Canada* 128(S128): 1–269. <https://doi.org/10.4039/entm116128fv>
- Brundin L (1966) Transantarctic relationships and their significance, as evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteniinae and the austral Heptagyiinae. *Kungliga Svenska VetenskapsAkademiens Handlingar* 11: 1–472.
- Caldwell BA, Hudson PL, Lenat DR, Smith DR (1997) A revised annotated checklist of the Chironomidae (Insecta: Diptera) of the Southeastern United States. *Transactions of the American Entomological Society* 123(1+2): 1–53.
- Contreras-Ramos A (2021) Comisión nacional para el conocimiento y uso de la biodiversidad C. Reconocimiento de la biodiversidad de la Reserva de la Biósfera Calakmul: Odonata, Psocóptera y Díptera acuáticos (Insecta). Comisión nacional para el conocimiento y uso de la biodiversidad. [Occurrence dataset] <https://doi.org/10.15468/qbgvur> [Accessed via GBIF.org on November 20<sup>th</sup>, 2021]
- Contreras-Ramos A, Andersen T (1999) A survey of the Chironomidae (Diptera) of Calakmul Biosphere Reserve, Mexico. *Chironomus Newsletter on Chironomidae Research* 12: 3–5. <https://www.ntnu.no/ojs/index.php/chironomus/article/view/106/92>

- Contreras-Ramos A, García Aldrete AN, González Soriano E (2000) Proyecto FB383/M003/97. Reconocimiento de la biodiversidad de la Reserva de la Biosfera Calakmul: Odonata, Psocoptera y Diptera acuáticos (Insecta). Informe Final. Instituto de Biología, UNAM, Departamento de Zoología, Ciudad de México, 28 pp. <https://www.conabio.gob.mx/institucion/proyectos/resultados/InfM003.pdf>
- Coquillett DW (1895) Descriptions of new genera and species. In: Johnson CW (Ed.) Diptera of Florida. Proceedings of the Academy of Natural Science 1895: 307–319.
- Coquillett DW (1900) Papers from the Harriman Alaska Expedition. IX. Entomological results (3): Diptera. Proceedings of the Washington Academy of Sciences 2: 389–464.
- Cranston PS (1995) Introduction. In: Armitage PD, Cranston PS, Pinder LCV (Eds) The Chironomidae. The biology and ecology of non-biting midges. Chapman & Hall, London, 1–7. [https://doi.org/10.1007/978-94-011-0715-0\\_1](https://doi.org/10.1007/978-94-011-0715-0_1)
- Cranston PS (2019) Identification guide to genera of aquatic larval Chironomidae (Diptera) of Australia and New Zealand. Zootaxa 4706(1): 71–102. <https://doi.org/10.11646/zootaxa.4706.1.3>
- Cranston PS, Ashe P (2013) 6. The larvae of Telmatogetoninae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Andersen T, Cranston PS, Epler J (Eds) Chironomidae of the Holarctic Region: Keys and diagnoses, Part 1: Larvae. Insect Systematics and Evolution, Supplements 66: 137–144.
- Cranston PS, Epler JH (2013) 5. The larvae of Tanypodinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Andersen T, Cranston PS, Epler J (Eds) Chironomidae of the Holarctic Region: Keys and diagnoses, Part 1: Larvae. Insect Systematics and Evolution, Supplements 66: 39–136.
- Cranston PS, Krosch MN (2015) DNA sequences and austral taxa indicate generic synonymy of *Paratrichocladus* Santos-Abreu with *Cricotopus* Wulp (Diptera: Chironomidae). Systematic Entomology 40(4): 719–732. <https://doi.org/10.1111/syen.12130>
- Cranston PS, Nolte U (1996) *Fissimentum*, a new genus of drought-tolerant Chironomini (Diptera: Chironomidae) from the Americas and Australia. Entomological News 107: 1–15. <https://www.biodiversitylibrary.org/part/31135>
- Cranston PS, Webb CJ, Martin J (1990) The saline nuisance chironomid *Carteronica longilobus* (Diptera: Chironomidae): a systematic reappraisal. Systematic Entomology 15(4): 401–432. <https://doi.org/10.1111/j.1365-3113.1990.tb00074.x>
- Cranston PS, Martin J, Mulder M, Spies M (2016a) Clarification of *Einfeldia* Kieffer, 1922 (Diptera: Chironomidae) with *E. australiensis* (Freeman, 1961), comb. n. based on immature stages. Zootaxa 4158(4): 491–506. <https://doi.org/10.11646/zootaxa.4158.4.3>
- Cranston PS, Martin J, Spies M (2016b) Cryptic species in the nuisance midge *Polypedilum nubifer* (Skuse) (Diptera: Chironomidae) and the status of *Tripedilum* Kieffer. Zootaxa 4079(4): 429–447. <https://doi.org/10.11646/zootaxa.4079.4.3>
- da Silva FL, Ekrem T (2016) Phylogenetic relationships of nonbiting midges in the subfamily Tanypodinae (Diptera: Chironomidae) inferred from morphology. Systematic Entomology 41(1): 73–92. <https://doi.org/10.1111/syen.12141>
- da Silva FL, Ferrington Jr LC (2018) Systematics of the new world genus *Pentaneura* Philip (Diptera: Chironomidae: Tanypodinae): historical review, new species and phylogeny. Zoologischer Anzeiger 274: 60–89. <https://doi.org/10.1016/j.jcz.2017.11.010>
- da Silva FL, Trivinho-Strixino S, Oliveira HRN (2010) New species of *Cryptochironomus* Kieffer, 1918 (Diptera: Chironomidae: Chironominae) from Brazil. Zootaxa 2614(1): 18–32. <https://doi.org/10.11646/zootaxa.2614.1.2>
- da Silva FL, Fonseca-Gessner AA, Ekrem T (2011) Revision of *Labrundinia maculata* Roback, 1971, a new junior synonym of *L. longipalpis* (Goetghebuer, 1921) (Diptera:



- Chironomidae: Tanypodinae). *Aquatic Insects* 33(4): 293–303. <https://doi.org/10.1080/01650424.2011.640434>
- da Silva FL, Fonseca-Gessner AA, Ekrem T (2014) A taxonomic revision of genus *Labrundinia* Fittkau, 1962 (Diptera: Chironomidae: Tanypodinae). *Zootaxa* 3769(1): 1–185. <https://doi.org/10.11646/zootaxa.3769.1.1>
- Dantas GPS, Hamada N (2018) Immature stages of *Laurotanypus travassosi* Oliveira, Mesias & Silva-Vasconcelos, 1992 reveal a new synonymy in Tanypodinae (Diptera: Chironomidae). *Zootaxa* 4444(4): 462–470. <https://doi.org/10.11646/zootaxa.4444.4.6>
- Dantas GPS, Hamada N, Mendes HF (2016) Contribution to the knowledge of *Stenochironomus* Kieffer (Diptera, Chironomidae) from Brazil: Seven new species and description of females and immatures of some previously known species. *Zootaxa* 4117(1): 1–47. <https://doi.org/10.11646/zootaxa.4117.1.1>
- de Oca FM, Tonello MS, Massaferro J, Sofia Plastani M, Laprida C (2020) The chironomids (Diptera: Chironomidae) of shallow lakes of the humid Pampa region, Argentina: An approach to paleoproductivity reconstruction. *Palaios* 35(4): 191–200. <https://doi.org/10.2110/palo.2019.071>
- Dendy JS, Sublette JE (1959) The Chironomidae (= Tendipedidae: Diptera) of Alabama with descriptions of six new species. *Annals of the Entomological Society of America* 52(5): 506–519. <https://doi.org/10.1093/aesa/52.5.506>
- Dijkstra K-DB, Monaghan MT, Pauls SU (2014) Freshwater biodiversity and aquatic insect diversification. *Annual Review of Entomology* 59(1): 143–163. <https://doi.org/10.1146/annurev-ento-011613-161958>
- Donato M, Andersen T (2022) A new species of *Goeldichironomus* Fittkau, 1965 from Argentina (Chironomidae, Chironominae). *Zootaxa* 5092(1): 143–150. <https://doi.org/10.11646/zootaxa.5092.1.9>
- Donato M, Paggi AC, Epler JH (2008a) New record, geographic variation and redescription of *Apedilum elachistus* Townes (Diptera: Chironomidae: Chironominae). *Studies on Neotropical Fauna and Environment* 43(2): 125–134. <https://doi.org/10.1080/01650520701437707>
- Donato M, Massaferro J, Brooks SJ (2008b) Chironomid (Chironomidae: Diptera) checklist from Nahuel Huapi National Park, Patagonia, Argentina. *Revista de la Sociedad Entomológica Argentina* 67: 163–170. <https://www.biotaxa.org/RSEA/article/view/31005>
- Donato M, Siri A, Mauad M (2012) Description of a new species of the genus *Onconeura* Andersen et Sæther (Diptera: Chironomidae) from Argentina with a cladistic analysis of the genus. *Zootaxa* 3580(1): 43–55. <https://doi.org/10.11646/zootaxa.3580.1.3>
- Edwards FW (1928) Nematocera. *Insects of Samoa* 6(2): 23–102. <https://iif.wellcome-collection.org/pdf/b29809071>
- Edwards FW (1931) *Diptera of Patagonia and South Chile. Part II. Fascicle 5. -Chironomidae*. Trustees of the British Museum (Natural History), London, 233–331.
- Edwards FW (1932) Notes on Highland Diptera, with descriptions of six new species. *Scottish Naturalist* 194: 43–52.
- Ekrem T, Willassen E, Stur E (2010) Phylogenetic utility of five genes for dipteran phylogeny: A test case in the Chironomidae leads to generic synonymies. *Molecular Phylogenetics and Evolution* 57(2): 561–571. <https://doi.org/10.1016/j.ympev.2010.06.006>
- Epler JH (1986) *Oukuriella*, a new genus of Chironomidae (Diptera) from South America. *Insect Systematics & Evolution* 17(2): 157–163. <https://doi.org/10.1163/187631286X00341>

- Epler JH (1987) Notes on the *Dicrotendipes* (Diptera: Chironomidae) of Mexico, with descriptions of two new species. *Entomologia Scandinavica*, Supplement 29: 147–154. [www.johnepler.com/1988%20Mexico%20Dicro.pdf](http://www.johnepler.com/1988%20Mexico%20Dicro.pdf)
- Epler JH (1988) Biosystematics of the genus *Dicrotendipes* Kieffer, 1913 (Diptera: Chironomidae: Chironominae) of the world. *Memoirs of the American Entomological Society* 36: 1–214. <https://www.biodiversitylibrary.org/part/198388>
- Epler JH (1996) New species of the *Oukuriella* (Diptera: Chironomidae) from Costa Rica. *Hydrobiologia* 318(1–3): 3–11. <https://doi.org/10.1007/BF00014126>
- Epler JH (2017) An annotated preliminary list of the Chironomidae (Diptera) of Zurquí, Costa Rica. *Chironomus* 30(30): 4–18. <https://doi.org/10.5324/cjcr.v0i30.2240>
- Epler JH (2019) Checklist of the Chironomidae of Florida. <http://johnnepler.com/FLchiro.html>
- Epler JH, Ekrem T, Cranston PS (2013) 10. The larvae of Chironominae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Andersen T, Cranston PS, Epler J (Eds) *Chironomidae of the Holarctic Region, Keys and diagnoses, Part 1 Larvae*. *Insect Systematics and Evolution*, Supplement 66: 387–556.
- European Bioinformatics Institute (2022) INSDC Sequences. Version 1.8. European Nucleotide Archive (EMBL-EBI). [Occurrence dataset] <https://doi.org/10.15468/sbmztx> [Accessed via GBIF.org on December 15<sup>th</sup>, 2022]
- Fabricius JC (1794) *Entomologia systematica emendata et aucta, secundum classes, ordines, genera, species, adjectis synonymis, locis, descriptionibus*. Hafniae [= København] 4: 1–472. <https://www.biodiversitylibrary.org/item/218709#page/12/mode/1up>
- Ferrari BJD, Vignati DAL, Roulier J-L, Coquery M, Szalinska E, Bobrowski A, Czaplicka A, Dominik J (2019) Chromium bioavailability in aquatic systems impacted by tannery wastewaters. Part 2: New insights from laboratory and in situ testing with *Chironomus riparius* Meigen (Diptera, Chironomidae). *The Science of the Total Environment* 653: 1–9. <https://doi.org/10.1016/j.scitotenv.2018.10.258>
- Ferrington Jr LC, Sæther OA (2011) A revision of the genera *Pseudosmittia* Edwards, 1932, *Allocladius* Kieffer, 1913, and *Hydrosmittia* gen. n. (Diptera: Chironomidae, Orthoclaadiinae). *Zootaxa* 2849(1): 1–314. <https://doi.org/10.11646/zootaxa.2849.1.1>
- Fittkau EJ (1968) *Siolimyia amazonica* n. gen. n. spec., eine flugfähige Chironomide (Diptera) mit einem Hypopygium inversum. *Amazoniana* 1: 259–265. <https://core.ac.uk/download/pdf/224972928.pdf>
- Fittkau EJ, Reiss F (1979) Die zoogeographische Sonderstellung der neotropischen Chironomiden (Diptera). *Spixiana* 2: 273–280. [https://www.zobodat.at/pdf/Spixiana\\_002\\_0273-0279.pdf](https://www.zobodat.at/pdf/Spixiana_002_0273-0279.pdf)
- Fonseca Leal JJ, Esteves FA, Callisto M (2004) Distribution of Chironomid larvae in an Amazonian flood-plain lake impacted by bauxite tailings (Brazil). *Amazonia* 18(1): 109–123. <https://ia802302.us.archive.org/4/items/amazoniana-18-1-2-109-123/amazoniana-18-1-2-109-123.pdf>
- Fusari LM, Roque FO, Hamada N (2013) Review of *Xenochironomus* Kieffer, 1921 (Diptera: Chironomidae) with description of six new species. *Zootaxa* 3646(2): 101–126. <https://doi.org/10.11646/zootaxa.3646.2.1>
- Fusari LM, Roque FO, Hamada N (2014) Systematics of *Oukuriella* Epler, 1986, including a revision of the species associated with freshwater sponges. *Insect Systematics & Evolution* 44(2): 1–41. <https://doi.org/10.1163/1876312X-04402006>
- Fusari LM, Pinho LC, Lamas CJE (2017) New species and records of *Zavreliella* Kieffer, 1920 from Neotropical region (Diptera: Chironomidae). *Zootaxa* 4221(4): 486–490. <https://doi.org/10.11646/zootaxa.4221.4.5>



- GBIF (2023) The Global Biodiversity Information Facility. <https://www.gbif.org> [Accessed on September 16<sup>th</sup>, 2023]
- Giberson DJ, Bilyj B, Burgess N (2001) Species diversity and emergence patterns of nematoceros flies (Insecta: Diptera) from three coastal salt marshes in Prince Edward Island, Canada. *Estuaries* 24(6): 862–874. <https://doi.org/10.2307/1353177>
- Goeldi EA (1905) Os mosquitos no Pará. *Memorias do Museu Goeldi (Museu Paraense) de Historia Natural e Etnographia* 4: 134–139. <http://repositorio.museu-goeldi.br/handle/mgoeldi/1163>
- Goetghebuer M (1921) Chironomides de Belgique et spécialement de la Zone des Flandres. *Mémoires du Musée Royal d'Histoire Naturelle de Belgique* 8: 1–210. <https://doi.org/10.5962/bhl.title.52331>
- Gomes WIA, Jovem-Azevêdo D da S, Paiva FF, Milesi SV, Molozzi J (2018) Functional attributes of Chironomidae for detecting anthropogenic impacts on reservoirs: A bio-monitoring approach. *Ecological Indicators* 93: 404–410. <https://doi.org/10.1016/j.ecolind.2018.05.006>
- Granados-Ramírez JG, Barragán-Zaragoza P, Trejo-Albarrán R, Martínez-Alaníz M (2017) Macroinvertebrados bentónicos de dos lagos de alta montaña en el estado de Morelos, México. *Intropica* 12(1): 41–53. <https://doi.org/10.21676/23897864.2206>
- Hagenlund LK, Andersen T, Mendes HF (2010) New species of *Lopescladius* (*Cordiella*) Coffman et Roback (Chironomidae: Orthocladiinae) from Brazil. *Zootaxa* 2728(1): 39–49. <https://doi.org/10.11646/zootaxa.2728.1.3>
- Halffter G (1987) Biogeography of the montane entomofauna of Mexico and Central America. *Annual Review of Entomology* 32(1): 95–114. <https://doi.org/10.1146/annurev.en.32.010187.000523>
- Halffter G, Morrone JJ (2017) An analytical review of Halffter's Mexican transition zone, and its relevance for evolutionary biogeography, ecology and biogeographical regionalization. *Zootaxa* 4226(1): 1–46. <https://doi.org/10.11646/zootaxa.4226.1.1>
- Hamerlík L, Wojewódka M, Zawisza E, Cohuo Duran S, Macario-Gonzalez L, Pérez L, Szeroczyńska K (2018) Subfossil Chironomidae (Diptera) in surface sediments of the sinkholes (cenotes) of the Yucatan Peninsula: Diversity and distribution. *Journal of Limnology* 77: 213–219. <https://doi.org/10.4081/jlimnol.2018.1769>
- Harvey MG, Bravo GA, Claramunt S, Cuervo AM, Derryberry GE, Battilana J, Seeholzer GF, Shearer McKay J, O'Meara BC, Faircloth BC, Edwards SV, Pérez-Emán J, Moyle RG, Sheldon FH, Aleixo A, Smith BT, Chesser RT, Silveira LF, Cracraft J, Brumfield RT, Derryberry EP (2020) The evolution of a tropical biodiversity hotspot. *Science* 370(6522): 1343–1348. <https://doi.org/10.1126/science.aaz6970>
- Huerta Jiménez H (2021) Comisión nacional para el conocimiento y uso de la biodiversidad. C. Actualización de la Colección de Artrópodos con importancia médica (CAIM), Laboratorio de Entomología, InDRE. Version 1.9. Comisión nacional para el conocimiento y uso de la biodiversidad. [Occurrence dataset] <https://doi.org/10.15468/y2rff2> [Accessed via GBIF.org on August 18<sup>th</sup>, 2021]
- Hufnagel L, Mics F (2021) Biodiversity of Mexico. In: Hufnagel L (Ed.) *Natural history and ecology of Mexico and Central America*. IntechOpen, London, 3–14. <https://doi.org/10.5772/intechopen.98690>
- Ibáñez-Bernal S, Coscarón S (1996) Simuliidae (Diptera). In: Llorente-Bousquets JE, García-Aldrete A, González Soriano E (Eds) *Biodiversidad, taxonomía y biogeografía de artrópodos de México: hacia una síntesis de su conocimiento*. Universidad Nacional Autónoma de México, México D.F., 578–589.

- Ibáñez-Bernal S, Strickman D, Martínez-Campos C (1996) Culicidae (Diptera). In: Llorente-Bousquets JE, García-Aldrete A, González Soriano E (Eds) Biodiversidad, taxonomía y biogeografía de artrópodos de México: hacia una síntesis de su conocimiento. Universidad Nacional Autónoma de México, México D.F., 591–602.
- Jackson GA (1977) Nearctic and Palearctic *Paracladopelma* Harnisch and *Saetheria* n. gen. (Diptera: Chironomidae). Journal of the Fisheries Research Board of Canada 34(9): 1321–1359. <https://doi.org/10.1139/f77-194>
- Jacobsen RE, Perry SA (2000) A review of *Beardius* Reiss & Sublette, with description of a new species from Everglades National Park, Florida (Insecta, Diptera, Chironomidae). Spixiana 23: 129–144. <https://www.biodiversitylibrary.org/part/66560>
- Johannsen OA (1905) Aquatic nematoceros Diptera. In: Needham JG, Morton KJ, Johannsen OA (Eds) May flies and midges of New York. Bulletin of the New York State Museum 86: 1–352. <https://www.biodiversitylibrary.org/bibliography/8531>
- Johannsen OA (1908) New North American Chironomidae. In: Felt EP (Ed.) 23<sup>rd</sup> report of the State Entomologist on injurious and other insects of the State New York, 1907. Bulletin of the New York State Museum 124: 264–285.
- Johannsen OA (1938) New species of Nematocera from Puerto Rico. The Journal of Agriculture of the University of Puerto Rico 22(2): 219–226. <https://doi.org/10.46429/jaupr.v22i2.12913>
- Johannsen OA (1946) Revision of the North American species of the genus *Pentaneura*. Journal of the New York Entomological Society 54: 267–289. <https://www.jstor.org/stable/25005180>
- Johnson CW (1924) Diptera of the Williams Galapagos Expedition. Zoologica (New York) 5(8): 85–92. <https://doi.org/10.5962/p.190334>
- Jyväsjärvi J, Virtanen R, Ilmonen J, Paasivirta L, Muotka T (2018) Identifying taxonomic and functional surrogates for spring biodiversity conservation. Conservation Biology 32(4): 883–893. <https://doi.org/10.1111/cobi.13101>
- Kieffer JJ (1906) Diptera. Fam. Chironomidae. In: Wytsman P (Ed.) Genera Insectorum 42: 1–78.
- Kieffer JJ (1909) Diagnoses de nouveaux chironomides d'Allemagne. Bulletin de la Société d'Histoire Naturelle de Metz 26: 37–56. <https://doi.org/10.5962/bhl.part.13505>
- Kieffer JJ (1911) Nouvelles descriptions de chironomides obtenus d'éclosion. Bulletin de la Société d'Histoire Naturelle de Metz 27: 1–60. <https://doi.org/10.5962/bhl.part.2983>
- Kieffer JJ (1926) Chironomiden der 2. Fram-Expedition (1898–1902). Norsk Entomologisk Tidsskrift 2: 78–89. [http://www.entomologi.no/journals/nje/old/V2/NET\\_02\\_02\\_1925.pdf](http://www.entomologi.no/journals/nje/old/V2/NET_02_02_1925.pdf)
- Konar S, Majumdar U (2021) Two new species of the genus *Glyptotendipes* Kieffer (Diptera: Chironomidae: Chironominae) from West Bengal India. Oriental Insects 55(3): 386–399. <https://doi.org/10.1080/00305316.2020.1831640>
- Krosch MN, Baker AM, Mather PB, Cranston PS (2011) Systematics and biogeography of the Gondwanan Orthocladiinae (Diptera: Chironomidae). Molecular Phylogenetics and Evolution 59(2): 458–468. <https://doi.org/10.1016/j.ympev.2011.03.003>
- Kyerematen KAR, Andersen T (2002) *Rheotanytarsus* Thienemann et Bause (Diptera: Chironomidae) from Central America and Mexico. Studies on Neotropical Fauna and Environment 37(1): 23–51. <https://doi.org/10.1076/snfe.37.1.23.2113>
- Kyerematen KAR, Sæther OA, Andersen T (2000) A review of the *Rheotanytarsus pellucidus* group (Diptera: Chironomidae). In: Hoffrichter O (Ed.) Late 20<sup>th</sup> century research on Chironomidae: an anthology from the 13<sup>th</sup> International Symposium on Chironomidae, Freiburg, 5–9 September 1997. Shaker Verlag, Aachen, 147–181.



- Lathrop BB, Mulla MS (1995) Mode of existence and seasonality of midge larvae (Diptera: Chironomidae) in man-made lakes in the Coachella Valley, Southern California. *Journal of the American Mosquito Control Association* 11(1): 77–83. [https://www.biodiversitylibrary.org/content/part/JAMCA/JAMCA\\_V11\\_N1\\_P077-085.pdf](https://www.biodiversitylibrary.org/content/part/JAMCA/JAMCA_V11_N1_P077-085.pdf)
- Lin X, Stur E, Ekrem T (2018) Molecular phylogeny and temporal diversification of *Tanytarsus* van der Wulp (Diptera: Chironomidae) support generic synonymies, a new classification and center of origin. *Systematic Entomology* 43(4): 659–677. <https://doi.org/10.1111/syen.12292>
- Lin XL, Zhao YM, Yan LP, Liu WB, Bu WJ, Wang XH, Zheng CG (2022) Mitogenomes provide new insights into the evolutionary history of Prodiamesinae (Diptera: Chironomidae). *Zoologica Scripta* 51(1): 119–132. <https://doi.org/10.1111/zsc.12516>
- Linnaeus C (1767) *Systema naturæ, per regna tria naturæ, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Editio duodecima reformata. Tomus I. Pars 2. L. Salvii, Holmiae [= Stockholm] 533–1327. <https://www.biodiversitylibrary.org/item/10326#page/4/mode/1up>
- Loew H (1861) Diptera. Americae Septentrionalis indigena. Centuria prima. *Berliner Entomologische Zeitschrift* 5: 307–359. <https://doi.org/10.5962/bhl.title.41102>
- Loew H (1866) Diptera Americae Septentrionalis Centuria Septima. *Berliner Entomologische Zeitschrift* 10(1–3): 1–54. <https://doi.org/10.1002/mmnd.18660100103>
- Macquart J (1826) *Insectes diptères du Nord de la France. I. Tipulaires*. Recueil des Travaux de la Société d'Amateurs des Sciences, de l'Agriculture et des Arts de Lille 1823–1824: 59–224. <https://doi.org/10.5962/bhl.title.8146>
- Malloch JR (1915) The Chironomidae, or midges, of Illinois, with particular reference to the species occurring in the Illinois River. *Bulletin of the Illinois State Laboratory of Natural History* 10(1–8): 275–543. <https://doi.org/10.21900/j.inhs.v10.376>
- Meigen JW (1818) Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten. Erster Teil. FW Forstmann, Aachen, [xxxvi +] 332 pp. <https://doi.org/10.5962/bhl.title.12464>
- Mendes HF, Andersen T (2008) A review of *Antillocladius* Sæther and *Litocladius* Mendes, Andersen et Sæther, with the description of two new Neotropical genera (Diptera, Chironomidae, Orthoclaadiinae). *Zootaxa* 1887(1): 1–75. <https://doi.org/10.11646/zootaxa.1887.1.1>
- Mendes HF, Pinho LC (2016) Family Chironomidae. *Zootaxa* 4122(1): 142–153. <https://doi.org/10.11646/zootaxa.4122.1.16>
- Mendes HF, Andersen T, Sæther OA (2004) A review of *Antillocladius* Sæther, 1981, *Comptosmittia* Sæther, 1981 and *Litocladius* new genus (Chironomidae, Orthoclaadiinae). *Zootaxa* 594(1): 1–82. <https://doi.org/10.11646/zootaxa.594.1.1>
- Mendes HF, Andersen T, Hagenlund LK (2011) New species and records of *Antillocladius* Sæther and *Litocladius* Mendes, Andersen et Sæther from Brazil and Costa Rica (Chironomidae: Orthoclaadiinae). *Zootaxa* 2915(1): 39–51. <https://doi.org/10.11646/zootaxa.2915.1.4>
- Mendoza-Arroyo GE, López-Toledo L (2017) Inventario florístico y entomofaunístico en tres objetos de conservación ecosistémicos en las zonas núcleo de las Reservas Estatales de Balam-kú y Balam-kin, Campeche. Secretaría de Educación Pública, Instituto Tecnológico de Chiná, Informe final SNIB-CONABIO, proyecto No. JF128, Ciudad de México, 131 pp. [www.conabio.gob.mx/institucion/proyectos/resultados/InfJF128.pdf](http://www.conabio.gob.mx/institucion/proyectos/resultados/InfJF128.pdf)
- Mendoza-Ponce AV, Corona-Núñez RO, Kraxner F, Estrada F (2020) Spatial prioritization for biodiversity conservation in a megadiverse country. *Anthropocene* 32: 100267. <https://doi.org/10.1016/j.ancene.2020.100267>

- Messias MC, de Oliveira SJ (2000) On a new species of the genus *Bryophaenocladus* (Chironomidae: Orthoclaadiinae). In: Hoffrichter O (Ed.) Late 20<sup>th</sup> century research on Chironomidae: an anthology from the 13<sup>th</sup> International Symposium on Chironomidae, Freiburg, 5–9 September 1997. Shaker Verlag, Aachen, 189–191.
- Messias MC, Fittkau EJ (1997) Two new species of the Neotropical genus *Oukuriella* Epler, 1986 (Insecta, Diptera, Chironomidae). *Spixiana* 20(3): 255–260.
- Mittermeier RA, Turner WR, Larsen FW, Brooks TM, Gascon C (2011) Global biodiversity conservation: the critical role of hotspots. In: Zachos F, Habel J (Eds) *Biodiversity Hotspots*. Springer, Berlin Heidelberg, 3–22. [https://doi.org/10.1007/978-3-642-20992-5\\_1](https://doi.org/10.1007/978-3-642-20992-5_1)
- Molineri C, Tejerina EG, Torrejón SE, Pero EJI, Hankel GE (2020) Indicative value of different taxonomic levels of Chironomidae for assessing the water quality. *Ecological Indicators* 108: 105703. <https://doi.org/10.1016/j.ecolind.2019.105703>
- Navarrete-Salgado NA, Fernández-Guillermo E, Contreras-Rivero G (2004) Abundancia de Quironómidos (Diptera: Chironomidae) en el bordo “JC” del norte del Estado de México en el periodo de secas. *Hidrobiológica* 14(2): 157–160. <https://hidrobiologica.izt.uam.mx/index.php/revHidro/article/view/943/530>
- Neubern CSO, Silva FL (2011) Two new species of *Larsia* Fittkau, 1962 (Diptera: Chironomidae: Tanypodinae) from Neotropical Region, with a checklist of *Larsia* species of the world. *Zootaxa* 2786(1): 27–41. <https://doi.org/10.11646/zootaxa.2786.1.2>
- Neubern CSO, Silva MAN, Fonseca-Gessner AA (2013) Neotropical *Ablabesmyia* Johannsen (Diptera: Chironomidae, Tanypodinae). – Part I. *Zootaxa* 3733(1): 1–123. <https://doi.org/10.11646/zootaxa.3733.1.1>
- Neubern CSO, Silva FL, Trivinho-Strixino S (2014) Four new species of *Clinotanypus* Kieffer, 1913 (Diptera: Chironomidae: Tanypodinae) from Neotropical region. *Journal of Natural History* 48(5–6): 317–343. <https://doi.org/10.1080/00222933.2013.825019>
- Nyman MT, Korhola AA (2005) Chironomid-based classification of lakes in western Finnish Lapland. *Boreal Environment Research* 10(4): 239–254. <https://www.borenv.net/BER/archive/pdfs/ber10/ber10-239.pdf>
- Oliver DR, Dillon ME (1994) Corrections and additions to “A catalog of Nearctic Chironomidae”. *Proceedings of the Entomological Society of Washington* 96: 8–10. <https://biostor.org/reference/56669>
- Oliver DR, Dillon ME, Cranston PS (1990) A catalogue of Nearctic Chironomidae. Research Branch, Agriculture Canada. Publication 1857/B, 89 pp. [https://esc-sec.ca/wp/wp-content/uploads/2017/03/AAFC\\_catalog\\_of\\_nearctic\\_chironomidae.pdf](https://esc-sec.ca/wp/wp-content/uploads/2017/03/AAFC_catalog_of_nearctic_chironomidae.pdf)
- Orel O, Orel (Zorina) OV (2014) To systematics of the genus *Saetheria* Jackson (Diptera, Chironomidae) from the Russian Far East. *Zootaxa* 3802(1): 65–74. <https://doi.org/10.11646/zootaxa.3802.1.5>
- Orel O, Orel (Zorina) OV (2017) Two new species and new records of the genus *Parachironomus* Lenz, 1921 (Diptera, Chironomidae) from northern Russia. *Zootaxa* 4312(3): 531–546. <https://doi.org/10.11646/zootaxa.4312.3.7>
- Ospina-Torres R, Riss W, Ruiz JL (1999) Guía para la identificación genérica de larvas de quironómidos (Diptera: Chironomidae: Orthoclaadiinae) de la Sabana de Bogotá. I. Subfamilia Orthoclaadiinae. In: Amat-G G, Andrade-C MG, Fernández F (Eds) *Insectos de Colombia II*. Academia Colombiana de Ciencias Exactas, Físicas y Naturales, Colección Jorge Alvarez Lleras No. 13, Bogotá, 363–384. <https://www.scribd.com/document/415471142/ACCEFVN-AC-spa-1999-Insectos-de-Colombia-pdf>
- Paetzold A, Schubert CJ, Tockner K (2005) Aquatic terrestrial linkages along a braided-river: Riparian arthropods feeding on aquatic insects. *Ecosystems* (New York, N.Y.) 8(7): 748–759. <https://doi.org/10.1007/s10021-005-0004-y>



- Paggi AC, Zilli F (2018) Redescription of two species of *Coelotanypus* (Kieffer) 1913 (Diptera: Chironomidae) in rivers of the Parano-Platense basin (Argentina, South America). *Zootaxa* 4486(1): 67–75. <https://doi.org/10.11646/zootaxa.4486.1.4>
- Panatta L, Stenert C, Santos EM, Maltchik L (2007) Diversity and distribution of Chironomid larvae in wetlands in Southern Brazil. *Journal of the Kansas Entomological Society* 80(3): 229–242. [https://doi.org/10.2317/0022-8567\(2007\)80\[229:DADO-CL\]2.0.CO;2](https://doi.org/10.2317/0022-8567(2007)80[229:DADO-CL]2.0.CO;2)
- Pinho LC (2022) Chironomidae. In: Catálogo Taxonômico da Fauna do Brasil. <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2191>
- Pinho LC, Andersen T (2021) Neotropical *Nilothauma* Kieffer, 1921 (Diptera, Chironomidae): Key, eleven new species, re-descriptions, new combination and new records. *ZooKeys* 1033: 81–125. <https://doi.org/10.3897/zookeys.1033.60686>
- Pinho LC, da Silva FL (2020) Description of two new species of *Polypedilum* (Asheum) and immature stages of *Polypedilum* (A.) *curticaudatum* (Diptera: Chironomidae). *Zootaxa* 4759(2): 179–190. <https://doi.org/10.11646/zootaxa.4759.2.2>
- Pinho LC, Souza JF (2013) New species of *Xestochironomus* Sublette et Wirth, 1972 (Diptera: Chironomidae) from Atlantic Forest, Brazil. *Zootaxa* 3652(5): 595–600. <https://doi.org/10.11646/zootaxa.3652.5.9>
- Pinho LC, Mendes HF, Andersen T (2009a) A review of *Skutzia* Reiss, 1985, with the description of three new species (Diptera: Chironomidae: Chironominae). *Journal of the North American Benthological Society* 28(1): 196–206. <https://doi.org/10.1899/08-074.1>
- Pinho LC, Mendes HF, Andersen T (2009b) A review of *Diplosmittia* Sæther, with the description of four new Neotropical species (Diptera: Chironomidae). *Studies on Neotropical Fauna and Environment* 44(3): 163–182. <https://doi.org/10.1080/01650520903187597>
- Pinho LC, Mendes HF, Andersen T (2013) Revision of *Beardius* Reiss et Sublette, 1985 (Diptera: Chironomidae), with the description of twenty new species. *Zootaxa* 3742(1): 1–78. <https://doi.org/10.11646/zootaxa.3742.1.1>
- Pinho LC, Dantas GPS, Hamada N (2019) Some notes on taxonomy and distribution of Neotropical *Aedokritus* Roback and *Axarus* Roback (Diptera: Chironomidae: Chironominae). *Zootaxa* 4668(4): 535–542. <https://doi.org/10.11646/zootaxa.4668.4.6>
- Plikk A, Engels S, Luoto TP, Nazarova L, Salonen JS, Helmens KF (2019) Chironomid-based temperature reconstruction for the Eemian Interglacial (MIS 5e) at Sokli, northeast Finland. *Journal of Paleolimnology* 61(3): 355–371. <https://doi.org/10.1007/s10933-018-00064-y>
- Porinchu DF, MacDonald GM (2003) The use and application of freshwater midges (Chironomidae: Insecta: Diptera) in geographical research. *Progress in Physical Geography* 27(3): 378–422. <https://doi.org/10.1191/0309133303pp388ra>
- Priego Santander AG, Esteve Selma MA (2017) Análisis de la complejidad y heterogeneidad de los paisajes de México. *Papeles de Geografía* 63(63): 7–20. <https://doi.org/10.6018/geografia/2017/259991>
- Qi X, Shi SD, Wang XH (2009) A review of *Paratendipes* Kieffer from China (Diptera: Chironomidae). *Aquatic Insects* 31(1): 63–70. <https://doi.org/10.1080/01650420802610205>
- Reiss F (1972) Die Tanytarsini (Chironomidae, Diptera) Südchiles und Westpatagoniens. Mit Hinweisen auf die Tanytarsini-Fauna der Neotropis. *Studies on Neotropical Fauna* 7(1): 49–94. <https://doi.org/10.1080/01650527209360434>
- Reiss F (1982) Chironomidae. In: Hurlbert SH, Villalobos-Figueroa A (Eds) *Aquatic biota of Mexico, Central America and the West Indies*. San Diego State University, San Diego, California, 433–438.

- Reiss F (1990) Revision der Gattung *Zavreliella* Kieffer, 1920 (Diptera: Chironomidae). *Spixiana* 13(1): 83–115. <https://www.biodiversitylibrary.org/part/66418>
- Reiss F, Sublette JE (1985) *Beardius* new genus with notes on additional Pan-American taxa (Diptera, Chironomidae). *Spixiana*, Supplement 11: 179–193.
- Rempel JG (1939) Neue Chironomiden aus Nordostbrasilien. *Zoologischer Anzeiger* 127: 209–216.
- Roback SS (1963) New Neotropical *Coelotanypus* (Diptera, Tendipedidae, Pelopiinae). *Entomological News* 74: 169–176.
- Roback SS (1964) A new *Pelopia* from Mexico (Diptera: Tendipedidae). *Entomological News* 75: 141–143.
- Roback SS (1965) New species and records of *Coelotanypus* from Mexico and Central America with a key to the new world species south of the United States. *Entomological News* 76: 29–41.
- Roback SS (1966) The Catherwood Foundation Peruvian-Amazon Expedition. XII Diptera, with some observations on the salivary glands of the Tendipedidae. *Monographs - Academy of Natural Sciences of Philadelphia* 14: 305–375.
- Roback SS (1971) The adults of the subfamily Tanypodinae (= Pelopiinae) in North America (Diptera: Chironomidae). *Monographs - Academy of Natural Sciences of Philadelphia* 17: 1–410.
- Roback SS (1975) A new subgenus and species of the genus *Tanytarsus* (Chironomidae: Chironominae: Tanytarsini). *Proceedings of the Academy of Natural Sciences of Philadelphia* 127: 71–80. [https://www.jstor.org/stable/4064703?seq=1#metadata\\_info\\_tab\\_contents](https://www.jstor.org/stable/4064703?seq=1#metadata_info_tab_contents)
- Roback SS (1987) New species of *Labrundinia* from Colombia (Diptera: Chironomidae: Tanypodinae). *Proceedings of the Academy of Natural Sciences of Philadelphia* 139: 211–221. <https://www.jstor.org/stable/pdf/4064898.pdf>
- Roback SS, Coffman WP (1983) Results of the Catherwood Bolivian-Peruvian Altiplano expedition Part II. Aquatic Diptera including montane Diamesinae and Orthoclaadiinae (Chironomidae) from Venezuela. *Proceedings of the Academy of Natural Sciences of Philadelphia* 135: 9–79.
- Rodríguez P, Ochoa-Ochoa LM, Munguía M, Sánchez-Cordero V, Navarro-Sigüenza AG, Flores-Villela OA, Nakamura M (2019) Environmental heterogeneity explains coarse-scale  $\beta$ -diversity of terrestrial vertebrates in Mexico. *PLOS ONE* 14(1): e0210890. <https://doi.org/10.1371/journal.pone.0210890>
- Roque FO, Correia LCS, Trivinho-Strixino S, Strixino G (2004) A review of Chironomidae studies in lentic system in the state of São Paulo, Brazil. *Biota Neotropica* 4(2): 1–19. <https://doi.org/10.1590/S1676-06032004000200018>
- Ruiz-Moreno JL, Ospina-Torres R, Gómez-Sierre H, Riss W (2000) Guía para la identificación genérica de larvas de quironómidos (Diptera: Chironomidae) de la Sabana de Bogotá. III. Subfamilias Tanypodinae, Podonominae y Diamesinae. *Caldasia* 22: 34–60. <https://revistas.unal.edu.co/index.php/cal/article/view/17550/18401>
- Sæther OA (1973) Four species of *Bryophaenocladus* Thien., with notes on other Orthoclaadiinae (Diptera: Chironomidae). *Canadian Entomologist* 105(1): 51–60. <https://doi.org/10.4039/Ent10551-1>
- Sæther OA (1981) Orthoclaadiinae (Diptera: Chironomidae) from the British West Indies, with descriptions of *Antillocladius* n. gen., *Lipurometriocnemus* n. gen., *Comptosmittia* n. gen. and *Diplosmittia* n. gen. *Entomologica Scandinavica*, Supplement 16: 1–46.
- Sæther OA (1982) Orthoclaadiinae (Diptera: Chironomidae) from SE U.S.A., with descriptions of *Pludsonia*, *Unniella* and *Platysmittia* n. genera and *Atelopodella*



- n. subgen. *Insect Systematics & Evolution* 13(4): 465–510. <https://doi.org/10.1163/187631282X00309>
- Sæther OA (1983) Three new species of *Lopescladius* Oliveira, 1967 (syn. “*Cordites*” Brundin, 1966, n. syn.), with a phylogeny of the *Parakiefferiella* group. In: Roback SS (Ed.) Proceedings of the 8<sup>th</sup> International Symposium on Chironomidae, Jacksonville, July 25–28, 1982. *Memoirs of the American Entomological Society* 34: 279–298.
- Sæther OA (1986) The imagines of *Mesosmittia* Brundin, 1956, with description of seven new species (Diptera, Chironomidae). In: Fittkau EJ (Ed.) Beiträge zur Systematik der Chironomidae, Diptera. Spixiana, Supplement 11: 37–54. [file://eir.klient.uib.no/home7/nzmta/Downloads/part68262.pdf]
- Sæther OA (1990a) A review of the genus *Limnophyes* Eaton from the Holarctic and Afrotropical regions (Diptera: Chironomidae, Orthoclaadiinae). *Entomologica Scandinavica*, Supplement 35: 1–139.
- Sæther OA (1990b) A revision of the Neotropical types described as *Spaniotoma* (*Limnophyes*) by Edwards 1931, with the description of *Edwardsidia* gen. n. (Diptera: Chironomidae). *Insect Systematics & Evolution* 21(3): 305–319. <https://doi.org/10.1163/187631290X00229>
- Sæther OA (1995) *Metriocnemus* van der Wulp: seven new species, revision of species, and new records (Diptera: Chironomidae). *Annales de Limnologie* 31(1): 35–64. <https://doi.org/10.1051/limn/1995002>
- Sæther OA, Andersen T (2013a) 7. The larvae of Diamesinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Andersen T, Cranston PS, Epler J (Eds) Chironomidae of the Holarctic Region, Keys and diagnoses, Part 1 Larvae. *Insect Systematics & Evolution*, Supplements 66: 145–178.
- Sæther OA, Andersen T (2013b) 8. The larvae of Prodiamesinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. In: Andersen T, Cranston PS, Epler J (Eds) Chironomidae of the Holarctic Region, Keys and diagnoses, Part 1 Larvae. *Insect Systematics & Evolution*, Supplements 66: 179–188.
- Sæther OA, Oyewo EA (2008) Keys, phylogenies and biogeography of *Polypedilum* subgen. *Uresipedilum* Oyewo et Sæther (Diptera: Chironomidae). *Zootaxa* 1806(1): 1–34. <https://doi.org/10.11646/zootaxa.1806.1.1>
- Sæther OA, Roque FO (2004) New Neotropical species of *Nandeva* (Diptera: Chironomidae), with a phylogeny of the Tanytarsini. *Tijdschrift voor Entomologie* 147(1): 63–80. <https://doi.org/10.1163/22119434-900000141>
- Sæther OA, Sundal A (1999) *Cerobregma*, a new subgenus of *Polypedilum* Kieffer, with a tentative phylogeny of subgenera and species groups within *Polypedilum* (Diptera: Chironomidae). *Journal of the Kansas Entomological Society* 71: 315–382.
- Sæther OA, Andersen T, Pinho LC, Mendes HF (2010) The problems with *Polypedilum* Kieffer (Diptera: Chironomidae), with the description of *Probolum* subgen. n. *Zootaxa* 2497(1): 1–36. <https://doi.org/10.11646/zootaxa.2497.1.1>
- Sanseverino AM, Nessimian JL (2001) Hábitats de larvas de Chironomidae (Insecta, Diptera) em riachos de Mata Atlântica no Estado do Rio de Janeiro. *Acta Limnologica Brasiliensia* 13(1): 29–38.
- Sanseverino AM, Trivinho-Strixino S, Nessiman JL (2010) Taxonomic status of *Nimbocera* Reiss, 1972, a junior synonym of *Tanytarsus* van der Wulp, 1874 (Diptera: Chironomidae). *Zootaxa* 2359(1): 43–57. <https://doi.org/10.11646/zootaxa.2359.1.3>
- Säwedäl L (1981) Amazonian Tanytarsini II. Description of *Caladomyia* n. gen. and eight new species (Diptera: Chironomidae). *Entomologica Scandinavica* 12: 123–143. <https://doi.org/10.1163/187631281794709890>



- Say T (1823) Descriptions of dipterous insects of the United States. *Journal of the Academy of Natural Sciences of Philadelphia* 3: 9–54.
- Schöll F, Haybach A (2004) Topology of large European rivers according to their Chironomidae communities (Insecta: Diptera). *Annales de Limnologie* 40(4): 309–316. <https://doi.org/10.1051/limn/2004028>
- Serra-Tosio B (1977) Deux nouvelles espèces de Diamesinae du Mexique. *Bulletin de la Société Entomologique de France* 82(3–4): 99–104. <https://doi.org/10.3406/bsef.1977.21581> [Dipt. Chironomidae]
- Shimabukuro EM, Pepinelli M, Trivinho-Strixino S (2017) Brazilian Pseudochironomini (Diptera: Chironomidae) Part 1. New *Pseudochironomus* Malloch from highlands. *Zootaxa* 4317(1): 134–154. <https://doi.org/10.11646/zootaxa.4317.1.6>
- Sotelo-Casas RC, Cupul-Magaña AL, Rodríguez-Troncoso AP (2014) Primer registro del género *Clunio* (Diptera: Chironomidae) asociado a las comunidades coralinas de islas Marietas, México. *Revista Mexicana de Biodiversidad* 85(1): 14–23. <https://doi.org/10.7550/rmb.38165>
- Spies M (1999) A listing of Chironomidae reported from California <http://www.chironomidae.net/chklists/california.html> [Accessed on September 20<sup>th</sup>, 2023]
- Spies M (2000) A contribution to the knowledge of Holarctic *Parachironomus* Lenz (Diptera: Chironomidae), with two new species and a provisional key to Nearctic adult males. *Tijdschrift voor Entomologie* 143(1–2): 125–143. <https://doi.org/10.1163/22119434-99900041>
- Spies M, Reiss F (1996) Catalog and bibliography of Neotropical and Mexican Chironomidae (Insecta, Diptera). *Spixiana*, Supplement 22: 61–119. [https://www.zobodat.at/pdf/SpixSupp\\_022\\_0061-0119.pdf](https://www.zobodat.at/pdf/SpixSupp_022_0061-0119.pdf)
- Spies M, Sæther OA (2004) Notes and recommendations on taxonomy and nomenclature of Chironomidae (Diptera). *Zootaxa* 752(1): 1–90. <https://doi.org/10.11646/zootaxa.752.1.1>
- Spies M, Fittkau EJ, Reiss F (1994) The adult males of *Parachironomus* Lenz, 1921, from the Neotropical faunal region. *Spixiana*, Supplement 20: 61–98. <https://www.biodiversitylibrary.org/part/68095>
- Spies M, Andersen T, Epler JH, Watson Jr CN (2009) Chironomidae (Non-biting Midges). In: Brown BV, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA (Eds) *Manual of Central American Diptera*. Volume 1. NRC Research Press, Ottawa, Ontario, Canada, 437–480.
- Sublette JE (1960) Chironomid midges of California. I. Chironominae, exclusive of Tanytarsini (= Calopsectrini). *Proceedings of the United States National Museum* 112(3435): 197–226. <https://doi.org/10.5479/si.00963801.112-3435.197>
- Sublette JE (1964a) Chironomidae (Diptera) of Louisiana. I. Systematics and immature stages of some lentic chironomids of west-central Louisiana. *Tulane Studies in Zoology and Botany* 11: 109–150. <https://doi.org/10.5962/bhl.part.7051>
- Sublette JE (1964b) Chironomid midges of California. II. Tanypodinae, Podonominae, and Diamesinae. *Proceedings of the United States National Museum* 115(3481): 85–136. <https://doi.org/10.5479/si.00963801.115-3481.85>
- Sublette JE, Sasa M (1994) Chironomidae collected in Onchocerciasis endemic areas of Guatemala (Insecta, Diptera). *Spixiana*, Supplement 20: 1–60. [file://eir.klient.uib.no/home7/nzmta/Downloads/part68094.pdf]
- Sundaram M, Donoghue MJ, Farjon A, Filer D, Mathews S, Jetz W, Leslie AB (2019) Accumulation over evolutionary time as a major cause of biodiversity hotspots in conifer



- fers. Proceedings of the Royal Society B, Biological Sciences 286(1912): 20191887. <https://doi.org/10.1098/rspb.2019.1887>
- Tang H (2016) *Paralauterborniella* from Oriental China (Diptera: Chironomidae). Oriental Insects 50(4): 160–170. <https://doi.org/10.1080/00305316.2016.1217799>
- Townes HK (1945) The Nearctic species of Tendipedini (Diptera, Tendipedidae (= Chironomidae)). American Midland Naturalist 34(1): 1–206. <https://doi.org/10.2307/2421112>
- Trivinho-Strixino S (2011) Larvas de Chironomidae: Guia de Identificação. Universidade Federal de São Carlos, Departamento de Hidrobiologia, Laboratório de Entomologia Aquática, São Carlos, 371 pp.
- Trivinho-Strixino S, Pepinelli M (2015) A systematic study on *Endotribelos* Grodhaus (Diptera: Chironomidae) from Brazil including DNA barcoding to link males and females. Zootaxa 3936: 1–41. <https://doi.org/10.11646/zootaxa.3936.1.1>
- Trivinho-Strixino S, Shimabukuro EM (2018) Brazilian Pseudochironomini (Diptera: Chironomidae) Part 2. New *Pseudochironomus* and *Riethia* species. Zootaxa 4403(2): 245–260. <https://doi.org/10.11646/zootaxa.4403.2.2>
- Trivinho-Strixino S, Correia LCS, Sonoda K (2000) Phytophilous Chironomidae (Diptera) and other macroinvertebrates in the ox-bow Infernã Lake (Jataí Ecological Station, Luiz Antônio, SP, Brazil). Revista Brasileira de Biologia 60(3): 527–535. <https://doi.org/10.1590/S0034-71082000000300018>
- Trivinho-Strixino S, Silva FL, Roque FO (2010) A new species of *Parachironomus* Lenz, 1921 (Diptera: Chironomidae: Chironominae), and description of immature stages of two other species from the Neotropical Region. Zootaxa 2689: 1–14.
- van der Wulp FM (1874) Dipterologische Aanteekeningen. Tijdschrift voor Entomologie 17: 109–148.
- Vargas L (1946) *Macropelopia roblesi* (Tendipedidae, Diptera) n. sp. neotropical procedente de Chiapas, Mexico. Revista del Instituto de Salubridad y Enfermedades Tropicales 7: 79–84.
- Vargas L (1952) *Tendipes (Limnochironomus) californicus* y *Tendipes (Limnochironomus) figueroai* n. sp. (Diptera, Tendipedidae). Revista de la Sociedad Mexicana de Historia Natural 13: 47–51.
- Vinogradova EM (2008) Six new species of *Polypedilum* Kieffer, 1912, from the Yucatan Peninsula (Insecta, Diptera, Chironomidae). Spixiana 31: 277–288. [https://www.zobodat.at/pdf/Spixiana\\_031\\_0277-0288.pdf](https://www.zobodat.at/pdf/Spixiana_031_0277-0288.pdf)
- Vinogradova EM, Riss HW (2007) Chironomids of the Yucatan Peninsula. Chironomus Newsletter on Chironomidae Research 20: 32–35. <https://www.ntnu.no/ojs/index.php/chironomus/article/view/45/35>
- Wais IR (1987) Macrozoobenthos of Negro River basin, Argentine Patagonia. Studies on Neotropical Fauna and Environment 22(2): 73–91. <https://doi.org/10.1080/01650528709360721>
- Wang X, Andersen T, Sæther OA (2006) Neotropical *Bryophaenocladus* Thienemann, 1934 (Diptera: Chironomidae). Studies on Neotropical Fauna and Environment 41(1): 19–32. <https://doi.org/10.1080/01650520500228406>
- Watson Jr CN, Heyn MW (1993) A preliminary survey of the Chironomidae (Diptera) of Costa Rica, with emphasis on the lotic fauna. Netherlands Journal of Aquatic Ecology 26(2–4): 257–262. <https://doi.org/10.1007/BF02255249>
- Wiedenbrug S, Silva FL (2013) New species of *Nanocladius* Kieffer, 1913 (Diptera: Chironomidae: Orthoclaadiinae) from Neotropical region. Annales de Limnologie 49(4): 255–264. <https://doi.org/10.1051/limn/2013057>



- Wiedenbrug S, Silva FL (2016) *Diplosmittia caribensis*, a new Orthoclaadiinae (Diptera: Chironomidae) from the Dominican Republic. Zootaxa 4103(1): 71–74. <https://doi.org/10.11646/zootaxa.4103.1.8>
- Wiedenbrug S, Mendes HF, Pepinelli M, Trivinho-Strixino S (2009) Review of the genus *Onconeura* Andersen et Sæther (Diptera: Chironomidae), with the description of four new species from Brazil. Zootaxa 2265(1): 1–26. <https://doi.org/10.11646/zootaxa.2265.1.1>
- Wiedenbrug S, Lamas CE, Trivinho-Strixino S (2012) A review of the genus *Corynoneura* Winnertz (Diptera: Chironomidae) from the Neotropical region. Zootaxa 3574(1): 1–61. <https://doi.org/10.11646/zootaxa.3574.1.1>
- Wiedenbrug S, Lamas CJE, Trivinho-Strixino S (2013) A review of Neotropical species in *Thienemanniella* Kieffer (Diptera, Chironomidae). Zootaxa 3670(2): 215–237. <https://doi.org/10.11646/zootaxa.3670.2.7>
- Wiederholm T [Ed.] (1986) Chironomidae (Diptera) of the Holarctic region – Keys and diagnoses–Part 2–Pupae. Entomologica Scandinavia, Supplement 28: 1–482.
- Wiederholm T [Ed.] (1989) Chironomidae (Diptera) of the Holarctic region – Keys and diagnoses–Part 3–Adult males. Entomologica Scandinavia, Supplement 34: 1–532.
- Wirth WW (1949) A revision of the clunionine midges with descriptions of a new genus and four new species (Diptera: Tendipedidae). University of California Publications in Entomology 8: 151–182.
- Wirth WW (1969) New species and records of Galápagos Diptera. Proceedings of the California Academy of Sciences 36(20): 571–594.
- Yamamoto N, Yamamoto M (2015) A revised subgeneric position of *Polypedilum* (*Probolum*) *simantokeleum*, with description of a new *Uresipedilum* species in Japan (Diptera: Chironomidae). Zootaxa 3999(3): 439–445. <https://doi.org/10.11646/zootaxa.3999.3.9>
- Yan C, Wang X (2006) *Microchironomus* Kieffer from China (Diptera: Chironomidae). Zootaxa 1108(1): 53–68. <https://doi.org/10.11646/zootaxa.1108.1.4>
- Yan C, Jin Z, Wang X (2008) *Paracladopelma* Harnisch from the Sino-Indian Region (Diptera: Chironomidae). Zootaxa 1934(1): 1–29. <https://doi.org/10.11646/zootaxa.1934.1.1>
- Zhang R, Song C, Qi X, Wang X (2016) Taxonomic review on the subgenus *Tripodura* Townes (Diptera: Chironomidae: *Polypedilum*) from China with eleven new species and a supplementary world checklist. Zootaxa 4136(1): 1–53. <https://doi.org/10.11646/zootaxa.4136.1.1>